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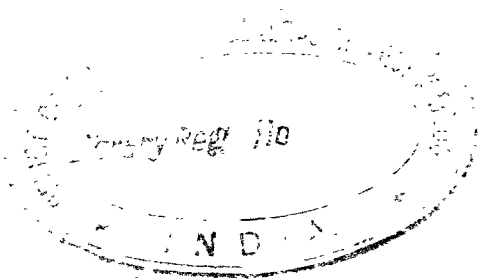
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The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.



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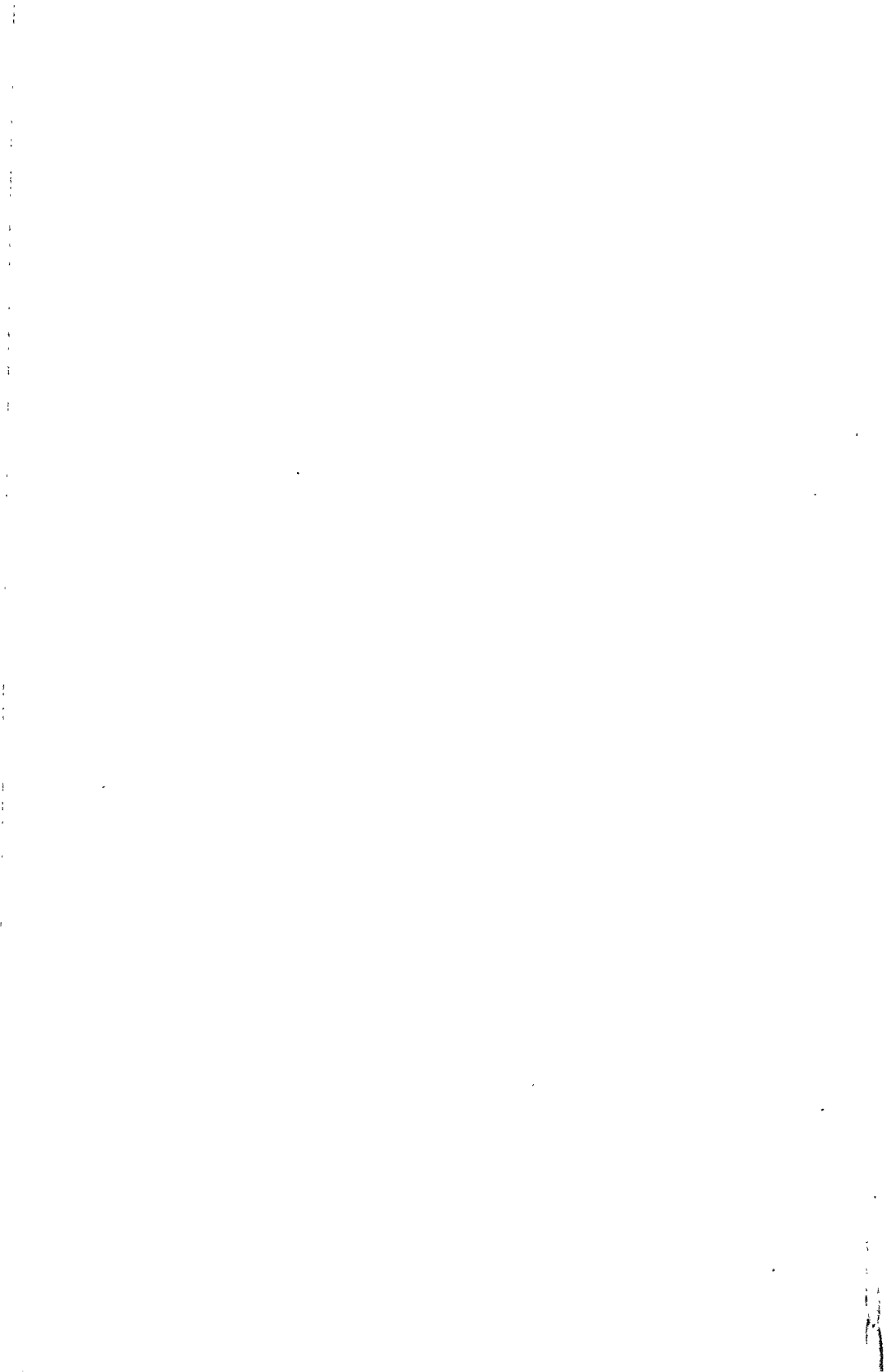
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The Geographical Journal.

No. 1.

JULY, 1893.

VOL. II.

THE ANNUAL ADDRESS ON THE PROGRESS OF GEOGRAPHY, 1892-93.*

By the Right Hon. Sir MOUNTSTUART E. GRANT DUFF,
G.C.S.I., F.R.S., *President.*

THIS year, as last, I may fittingly begin my address by saying something about our Evening Meetings. Of these, since our last anniversary, we have had sixteen, of which fourteen were regular and two were extra. At the first, which was held on June 20th, the Paper read was by Mr. Markham, whose name has been so long and so honourably connected with this Society. The subject was the life and discoveries of Columbus as seen in the light of recent research. It was published in the September number of our *Proceedings*, and formed a worthy tribute to the illustrious navigator, the fourth centenary of whose great achievement was so widely celebrated.

In it Mr. Markham tells us that much light has been thrown on the birth and early life of Columbus of late years by the examination of records at Genoa and Savona. He has little doubt that the great man was born in Genoa and baptised in the old church of San Stefano in the year 1447. He thinks that Columbus conceived the idea of sailing westward to the Indies even before he left Savona, whither he went with his father and mother in 1472. Having established these preliminaries, Mr. Markham discusses the alleged decision of the University of Salamanca against the proposals of the now world-famous adventurer, and finds that it rests on a very slight basis. He then considers the size and equipment of the ships, subjects which have been much discussed of recent years, and the still more keenly debated question of the land-fall. As to this he says: "The spot where Columbus first landed in the New World is the eastern end of the south side of Watling Island. This has been established by the arguments of Major and by the

* Delivered at the Anniversary Meeting, May 29th, 1893.

calculations of Murdoch beyond all controversy. The evidence is overwhelming. Watling Island answers to every requirement and every test, whether based on the admiral's description of the island itself, on the courses and distances thence to Cuba, or on the evidence of early maps. We have thus reached a final and satisfactory conclusion, and we can look back on that momentous event in the world's history with the certainty that we know the exact spot on which it occurred—on which Columbus touched the land when he sprang from his boat with the standard waving over his head."

Mr. Markham proceeds to defend his hero from the charge of inaccuracy which has been brought against him with reference to his homeward journey, showing that the charge of inaccuracy rests on the mistake of a copying clerk, and that the reckoning kept by him in his little vessel, the *Niña*, of 40 tons, was singularly accurate. Mr. Markham concludes by showing what an extraordinary impulse the discoveries of Columbus gave to other navigators, and cites the reasons which make him believe that a portrait preserved at Como (and of which a reproduction, taken from a photograph, is given in our *Proceedings* along with Mr. Markham's Paper) was really taken from life.

The first of our autumn meetings on November 5th was an extra one, called for the purpose of listening to a Paper on Uganda read by Captain Lugard to an enormous audience, so enormous that even the gallery of this theatre was quite full. He described his various journeys into the interior from Mombasa, a view of which was shown and explained by Mr. George Mackenzie, the former Administrator of the British East Africa Company. Amongst these journeys was one to explore the River Sabakhi, and to build stockades upon it, another to open up the little known country of Kikuyu, and a third to occupy Uganda. Capt. Lugard reached that country after crossing a high region covered with splendid natural pasture of grass and clover, which he believes would be eminently favourable to European colonisation. Thence he descended to the Kavirondo Plain, where he found himself amidst a dense population of very simple, good-hearted people, all of whom, men and women, repudiate any kind of clothing; thence he passed to Busoga, where everybody, men and women alike, wears garments made from the barks of various figs, and dyed black. Uganda itself he described as a country of low hills and valleys, with hardly an acre of level ground to be seen. Unyoro is a country of more lofty hills and peaks of granite, while both of them have the disagreeable peculiarity of being watered by few streams, and having, in their stead, river swamps in almost every valley. Specially interesting were the details of the expedition, made by Capt. Lugard from Uganda in 1891 to come into relations with the Sudanese refugees from the Equatorial Province, who had assembled on the southwest shore of the Albert Lake. He had to tell too of the Salt Lake and of the Semliki River, fed in its lower course below the Lake Albert

Edward by hundreds of streams of snow-water from the great mountain, Ruwenzori, a fine photograph of which was much admired.

With great tact and judgment Capt. Lugard avoided all political or religious questions, and wound up his remarks with the following sentences, to whose Semitic turn of phrase and lapidary strength I called the attention of those present as soon as he had sat down:—

“So I brought down the Sudanese from Kavalli; and I built five forts from north to south from the Albert to the Albert Edward; and I located the Sudanese in them by regiments and companies; and I left Mr. De Winton in charge of Toru—the country bordering the base of the Ruwenzori Range—with orders to protect these people, both from the licence of the Sudanese and from Kabarega. And when the people saw that we had built these forts and left these Sudanese, and a European was come to live among them, they doubted no longer that we meant to protect them, and place a barrier between them and Kabarega on the one hand, and the Manyema on the other. And De Winton wrote to me shortly afterwards and said they were escaping from their slavery in Unyoro, and coming in on every side by thousands, with great rejoicing.

“And De Winton did as I had told him, and went round the country with Kasagama, and appointed chiefs to districts, and helped him to arrange the country in peace—such peace as it had not known for years and years. And in this task this brave young officer died.”

At the next meeting, on November 14th, the first regular one of the Society during the session, Dr. Nansen was the hero, and explained to an audience, almost as numerous as that which listened to Captain Lugard, his plans for exploring the Arctic Regions. He described the vessel called the *Fram*, that is the “Forward,” which he has had built near Christiania for the peculiar service he means her to undertake. In her he proposes to pass through the Kara Sea and to arrive near the mouth of the Lena. Thence taking advantage of the current of relatively warm water brought down by that river, he intends to advance northwards and to get into the ice which he believes will convey him over or near the North Pole towards the coast of Greenland, and so into more or less known regions. His arrangements, which showed infinite resource and ingenuity, were criticised in a most friendly manner by several of the most noted Arctic authorities, but most of them were rather friendly than hopeful. Admiral Inglefield was very encouraging, and mentioned the fact that he had himself seen a large log of wood on the west coast of Greenland which could by no possibility have come from anywhere save Siberia, and must have taken very much the course which Dr. Nansen had decided to follow. Dr. Nansen’s paper was itself full of very weighty statements as to the manner in which the Polar currents carry Siberian produce to the Greenland Coast.

Captain Lugard's Paper having been read first at the moment when Uganda was exciting so very much interest in the political world, drew a huge multitude to the doors of this theatre, a multitude far greater than it could accommodate. We had accordingly, on November 24th, an extra or, so to speak, overflow meeting, at which it was again read under the Presidency of our Foreign Secretary, General Sir C. P. Beauchamp Walker.

On November 28th we had the pleasure of listening to our old friend, Mr. Joseph Thomson, who gave us an account of his expedition from the shores of Lake Nyasa towards Lake Bangweolo and the headwaters of the Congo; an expedition in which he showed all the courage and endurance with which we are so familiar in his character. By this time I think he has walked over something like 18,000 miles of Africa. His young companion, Mr. Grant, who, as Mr. Thomson's first lieutenant, proved himself a worthy son of "Grant of the Nile," was also welcomed by us that evening, and delivered a speech which was extremely well received by the members present.

On December 5th the temperature had fallen to below freezing-point, and the zeal of the Society had, for the moment, declined with the temperature; so that the audience which came to welcome Mr. Wilkinson and Captain Gallwey was only moderately numerous. The first had to tell us about the so-called Kalahari desert which he approached through Bechuanaland. He found it far from a desert—rather a sandy region overgrown with spiny trees and shrubs, often so intricate as to present great difficulties to a traveller moving with ox-waggons. He traced the Molopo River through a good deal of its course not hitherto—so far as I know—described.

Captain Gallwey, H.M.'s Vice-Consul in the Oil Rivers, had visited the city of Benin, still a disgusting centre of the worst sort of African savagery, but likely, we may hope, ere long to be affected by better influences, and had a good deal that was interesting to say about the beauty of the waterways of that region at a distance from the coast, their crystal purity and great depth, as well as the charms of the vegetation upon their banks. It was agreeable to hear that they had no attractions for the sportsman, save in the shape of alligators and curlews, of whom the latter, it may be hoped, will have the sense to disappear if that predatory species makes its appearance in any numbers.

The Paper on December 19th was read—and very well read—by Captain Dundas, R.N., the same whose adventures on the Tana were recounted to us some time ago, not, however, by himself, but by Mr. Gedge. To-night we were taken to the Jub River, which Captain Dundas ascended for some 400 miles unaccompanied by a single European, without firing a single shot in anger. More than once, however, he was in imminent danger of his life amongst the fierce

Somali population. The story of his landing at Bardera accompanied only by a single interpreter, walking straight up to the chief and asking him whether it was to be peace or war, when he knew it depended on a nod from that savage potentate whether he should or should not be instantly murdered, deserves to be remembered as a very striking illustration of British courage and coolness.

At the first meeting of the year 1893, held upon January 16th, the Paper was read by Mr. Charles Hose, an official of the Sarawak Government, and contained an account of a journey made by him up the Baram River to the highlands of Borneo, which included an interesting description of the ascent of Mount Dulit, a flat-topped hill over 5000 feet high. Mr. Hose had paid considerable and most creditable attention as well to the flora as to the fauna of the district which he had traversed; and Mr. Bowdler Sharpe, of the British Museum, bore testimony to the very excellent work which he had done as an ornithologist. Some of Mr. Hose's experiences were sufficiently curious, as, for instance, the following:—"One morning one of my Dyak hunters returned, declaring that he had heard a tiger. Being very unwilling to believe this, and wishing to convince them that no tiger exists in Borneo, I took a Dyak and two Punans with our guns, and having walked half a mile in the direction pointed out to us, we heard a strange booming noise, very loud it is true, but not much resembling the roar of a tiger. I asked the Punans what they thought it was, and they replied 'Jawi,' toad. As we came up to the spot, the noise seemed to resound through the rocks, and sure enough, between the crevices, was a toad of gigantic size, bellowing lustily. As we tried to catch him, he backed further into his hiding-place until he was out of reach, and we were obliged to give up the hope of securing him; but a few days afterwards we procured a fine specimen of this toad, which measured $14\frac{1}{2}$ inches round the belly, and 3 inches across the head. It had a hard rough black skin with warty excrescences on the back. These warts contain a poisonous fluid, some of which a Punan took, and, placing it in the toad's mouth, destroyed the creature, and its skin is now in the British Museum." The toad has been the subject of many strange legends; but I do not know that anything has been said of it much more strange than what is contained in the above paragraph.

Our next meeting took place on January 30th. At it two Papers were read. The first was by Professor Milne, who was absent in Asia; but the other was read by its author, Mr. A. H. Savage Landor, the representative of a name illustrious in English literature, and himself an artist of very considerable merit, who was with us. Both described journeys in the Northern Island of Japan, which we usually—but, apparently, incorrectly, for the Japanese name is Hokkaido—speak of as the Island of Yezo.

On February 13th we had Mr. Selous, the mightiest hunter of these

or, I suppose, of any other times—mighty, too, not only in the slaying of lions, but in the advancement of civilisation, and to whom I have had this afternoon the agreeable task of presenting the Founder's Medal.

On February 20th a Paper on his journey across Tibet was read by Captain Bower, of the 17th Bengal Cavalry, a journey during which he went over some 800 miles of new country, to say nothing of having spent about half his time at altitudes of from 14,000 to 16,000 feet above the level of the sea. It is the hard fate of modern travellers in Asia to be able to add to human knowledge only at the expense of spending months amongst some of the most detestable regions on the surface of the globe—regions which are unknown chiefly because no one is willing to inhabit them. Here is Captain Bower's general sketch of a large portion of the howling wilderness which he traversed.

"The whole of Central and Northern Tibet, and almost the whole of Western Tibet, is known as the Chang. It consists of a high tableland with hills, mostly of a rounded character; but here and there sharply-defined snowy ranges are met with. The mountains have a general east and west tendency, but no defined watershed exists; rivers may be met flowing in almost any direction, and all terminate in large salt lakes. These lakes appear to have been at one time much larger than they now are, as unmistakable signs that they are drying up are to be seen. An idea of the physical configuration of the country may be gathered from the fact that for five months we never once camped at a lower altitude than the summit of Mont Blanc; and all the enormous stretch of country we covered in that time contained not a single tree. The greater part of this Chang is, of course, uninhabitable for the greater part of the year, and most of the places that would afford grazing in summer are too far distant from suitable winter quarters to be availed of by the nomads. But round the edges a few are to be met with, living almost entirely on meat and dairy produce."

Our Honorary Secretary, Mr. Seebohm, gave, after the Paper had been read, an interesting account of the birds which had been procured during the expedition, consisting as it did of only seven species, but all of extreme rarity; while Mr. Thiselton Dyer, the Director of the Royal Gardens at Kew, has reported that amongst the one hundred and thirty species found by Dr. Thorold about half a dozen were absolutely new to science. The peculiar mode of growth adopted by well-known species in the Tibetan climate had also much interest for the botanist.

The Council had not a little difficulty in deciding between the rival claims to one of our medals for this year, which were advanced in favour of Captain Bower and the reader of the Paper of February 27th, and its decision might, I think, with great propriety, have been given on either side.

The reader of the Paper to which I allude was Mr. Rockhill, already

well known as the author of the 'Land of the Lamas,' who addressed us upon his more recent travels in Tibet. I wish we could also have welcomed him in person this afternoon, but I have, as you are all aware, had the honour and pleasure of handing the gold medal won by him to the representative of the great nation to whom his attainments as a student in the languages of the Far East and of a successful traveller have brought additional honour.

On March 13th we had a Paper from Mr. H. O. Forbes, well-known as a naturalist and as a traveller in the Eastern Archipelago. Its subject was the Chatham Islands and their relation to a former Southern Continent. These Chatham Islands—for there are others—are a small group 500 miles east of Port Lyttelton in the South Island of New Zealand, which Mr. Forbes had visited during the time he was in charge of the Museum at Canterbury. He had been led to visit them chiefly on account of a fragment of a bird's skull having been brought to him which excited his interest and surprise in a very high degree. After he reached the Islands he became certain that the bird was a species of *Aphanapteryx*, a large and remarkable member of the rail family which lived in the Island of Mauritius contemporaneously with the Dodo. From Mauritius it disappeared a couple of hundred years ago; but in the Chatham Islands it lived till recently. Taking occasion from the presence of this bird and a variety of nearly-related facts, Mr. Forbes argued in favour of the conclusion that it is highly probable that Professor Huxley's and Professor Kitchen Parker's divisions of the globe according to the distribution of life into a northern and into a southern land—an *aretogœa* and a *notogœa*—will turn out to be the two fundamental biological divisions of the globe, there was a centre of development at both poles; and that the wanderings and migrations of the fauna and flora, northwards or southwards, from age to age, and from one side of the Equator to the other, were regulated by glacial and genial periods, and by the elevation and subsidence of the land, or the flux and flow of the sea over the continental shelf. Dr. Günther and other distinguished naturalists were, as might have been expected, attracted to our meeting by a Paper which touched, at so many points, their favourite studies, and we enjoyed the great advantage of listening to their views upon the questions raised by Mr. Forbes.

On March 27th we made an excursion into the territories of our neighbours and friends of the Geological Society. I think it is desirable that we should occasionally, though not too often, cross both their frontiers and those of the Linnean with a view to keeping before the world our just claim to deal with everything which relates to the theatre of man's activity.

On this occasion the reader of the Paper was Professor Bonney, who maintained that glaciers constantly abrade but very rarely excavate.

The views of the late Professor Ramsay found a supporter, though by no means an uncompromising one, in a distinguished member of your council, Mr. Blanford, while Sir Henry Howorth, Mr. Freshfield, and Mr. Conway supported Professor Bonney's opinions.

At our next meeting, when we were honoured by the presence of the Prince of Wales, Mr. Curzon read some of the lighter portions of a Paper, which will duly appear in our *Journal*, upon his recent tour in French Indo-China.

Our very latest meeting was devoted to the Karakoram Ranges and their glaciers, of which Mr. Conway, who lately visited them, helped to a considerable extent by the Geographical Society, gave a very interesting account. Putting aside the Uganda evenings, and that which was given to Dr. Nansen, this was perhaps the most successful which we have had since the last Anniversary Meeting. Mr. Conway's skill as a lecturer, and the very intelligent way in which the slides were brought before the audience, gave him great advantages in addition to those which were supplied by the subject itself. Col. Godwin Austen, the first pioneer of serious explorations in those remote regions, attended the meeting and addressed us after Mr. Conway had come to an end. The occasion was further signalised by the exhibition of very admirable sketches by Mr. McCormick and General Sir Michael Biddulph. The former accompanied Mr. Conway, as did a son of our trustee and former president, Lord Aberdare. Mr. Conway spoke most highly of Mr. Bruce's services, as well as of those rendered by the Ghoorkas under his command. Mr. Freshfield pointed the moral of the tale when he showed that in the employment of those Ghoorkas lay the future of Himalayan and trans-Himalayan exploration.

On the whole, I should be inclined to say that the meetings of this year have given more general satisfaction to the Society than those of any of the three previous years which have been held under my presidency, with the exception of the large one of 1890 in the Albert Hall, and I think the custom of adjourning to inspect the objects of interest in the next room after we have left the theatre, has become established as an institution.

I take this opportunity of once more thanking the Senate of the University of London for their great kindness in allowing us to assemble in this building.

THE 'PROCEEDINGS' AND 'JOURNAL.'

The issue of our *Proceedings* was continued regularly up to the end of 1892, but with the commencement of this year we took a new departure. It was thought desirable to enlarge the publication and to send it out to the world in a form more likely to attract the general reader than that in which it had previously appeared. There was

reason to think too that the old colour suggested a little too much a style of literature which carries our thoughts to Westminster and has obtained a reputation for dulness which perhaps it only partially deserves. We adopted accordingly a more attractive cover, and the result, whether of the internal or external merits of the *Geographical Journal*, as it is now called, has been that we have sold to the public during the first four months of the year on an average two hundred more copies each month than we used to do. Both in the old *Proceedings* and in the new *Journal* there have been a variety of papers and notices which have deserved much attention over and above the reports of our evening meetings.

I may mention one by Mr. Markham on the late Professor Freeman and his services to geography. Mr. Markham says that that distinguished man gave to geography its true place with reference to history, doing thereby good service to both departments of knowledge, and that his method will add a far wider and more numerous class of enquirers to the votaries of our science.

Then there were two Papers on the Orthography of Geographical Names by Colonel Dalton, and one by Mr. Freshfield on the Glacial Catastrophe in Savoy, which caused so much loss of life last year at the baths of St. Gervais. He described it as the explosion of a glacier by the stoppage of the subglacial water channels which drain it, or in other words, an avalanche riding on a flood.

Mr. Topley's account of the causes of the Sandgate landslip found, I doubt not, many readers.

A brief account in our October number of the railway from Antofagasta into the interior, by Mrs. Lilly Grove of Oxford, showed that additions may be made to our knowledge without passing beyond a region where civilised modes of travel prevail. A careful series of notes on recent explorations in British New Guinea, by Mr. Coutts Trotter, was reproduced in our November number after having been read at the Edinburgh meeting of the British Association; and in the same number there was an account of the Columbus meeting at Genoa, forwarded by Mr. Cust. He was prevented by illness from attending it, but his daughter supplied his place, and we are much obliged to her for the information with which she supplied us.

There is in our February number a brief but very interesting note upon the works of reclamation which have been carried on amongst the marshes of Western Russia. The figures are indeed almost startling, for we read of 800,000 acres transformed into meadow-land, and nearly 1,200,000 acres, which formerly consisted of impracticable marshes, dried and turned into forest land. In fact, if we can credit this account, the famous Pinsk Marshes have been to a great extent covered by prosperous farms.

The Reclamation of the Zuyder Zee, so often vaguely talked about,

has now been taken up in a more business-like way, and a sketch of the great work, by which it is proposed to accomplish it, is given in our *Journal* for March. It will require, however, an expenditure of £16,000,000, and the labour of a generation. If the hopes of its projectors are fulfilled, it will add something like half a million of acres to the land area of Holland.

Another great European improvement, the removal of the Iron Gates, forms the subject of a brief Paper in the same number. This has been going on steadily for a considerable time, and its completion may, we are told, be looked for in 1895.

Mr. Clinton Dent's Paper, On the Physiological Effects of High Altitudes, in our January number, will appeal to an already large and, if the Himalayas are to be seriously attacked, an increasing public.

Papers on Chitral and Chilas, the last by Sir Michael Biddulph, have a special interest at this moment, thanks to political circumstances, as has a brief account of Major Brown's work on the Fayum and Lake Moeris. I might, however, prolong this list considerably without mentioning all the Papers of merit, and must pass on to other matters.

In the geographical literature of the month we have reverted to an earlier system than that which has recently prevailed, of giving a brief non-critical notice, not only of books added to the library, but of papers of importance in the various departments of Geography which appear in periodical publications, and the organs of geographical and other societies. This section of our *Journal* is, in short, an index to the geographical literature of the month, so that by glancing at it the reader can, in a moment, see whether anything has appeared which is important to his own studies.

Geography occupied an important place at the British Association last autumn. Dr. James Geikie's opening address "On the Geographical Development of Coast Lines" was printed in our September number, in which were also summarised two Papers read to the Association by the Prince of Monaco, one upon a New Chart of the Currents of the North Atlantic, and the other upon the Proposed Establishment of Meteorological Observations at various points of that ocean, more especially in the Azores.

The last supplementary Paper published is a complete biography of Morocco, compiled by Sir Lambert Playfair and Dr. Robert Brown, both names which have long been honoured amongst geographers, and both of whom the Council has thanked for this excellent piece of work.

I pass now to the miscellaneous duties of the Society.

MISCELLANEOUS DUTIES OF THE SOCIETY.

We keep open, in return for the annual vote of £500 which is taken on the estimates, a map collection of great size and value which is open

to the public at large. During the last year about 2500 persons visited the map-room, but as I pointed out at our last Anniversary Meeting, we want a great deal more room, and could do much more valuable work for the public if we had it. I mentioned a year ago that we had about forty thousand books, fifty thousand maps or charts, seven thousand atlases, four thousand photographs, all of which have been steadily growing, as has also our stock of instruments. Many are the claims made upon us for the loan of these both by government officials and private persons.

Our work in the way of map-making is steadily increasing. Although our staff works exceedingly well, we are obliged to get a good deal of our map-drawing, fully half of it, I should think, done outside.

Twenty-four intending travellers have during the present year received instructions from Mr. Coles in route-surveying, and other matters of importance to them. Mr. Conway and Mr. Selous worked after their return for weeks in our offices constructing their own maps, a fact which shows how seriously the English traveller is beginning to take to the scientific side of his work. It will be remembered that those gentlemen won their earliest laurels, the first as an Alpine climber, the second as a slayer of wild beasts. The step is long from those commencements to the high position which they have now attained in connection with geography.

The long discussions which we have had with respect to the obtaining of geographical information from the Government of India have been brought, I trust, quite to an end by a letter from the India Office, by which we are informed, under the authority of the Secretary of State, that in the case of future reports the Indian Government has undertaken to make the geographical and statistical information in them available for the Royal Geographical Society by separating such information, where it is possible, from that which is confidential.

An earnest of good things to come has been given us by the forwarding to the Society of Captain Bower's report. Although my own connection with your affairs is coming to an end, I am sure I can promise for my successors that they will take very special care to play in every way into the hands of the Indian Government, and to make our alliance as mutually advantageous as possible. It is particularly agreeable to me that a controversy which I most deeply regretted should have been brought to so satisfactory a conclusion before my retirement.

Last year it was thought that it would be agreeable to the Fellows to revive the anniversary dinner, which had been intermitted for some years. A very large company, including many very distinguished persons, assembled to express their sympathy with the Society in its work, and the great success of that gathering had probably something to do with the considerable increase which has taken place in our numbers.

At the corresponding dinner of this year, which took place on the 13th, speeches were delivered by, amongst others, Sir Francis Grenfell, Mr. Bryce, Chancellor of the Duchy of Lancaster, Mr. Selous, Lord Kelvin, President of the Royal Society, Sir Robert Herbert, Sir Charles Tupper, Sir George Bowen, His Excellency the Swedish Minister, and Mr. Thiselton Dyer, the Director-General of the Royal Gardens at Kew.

One of the features of this gathering was the presence of representatives from various Provincial Societies, who found an able spokesman in Mr. Steinthal, of Manchester. Many years ago a resolution was passed at a General Meeting in favour of drawing closer the bonds which unite us with the other Geographical Societies of the Empire; these have much multiplied of late, increasing at the same time in activity, and it has been part of the recent policy of your Council to give the very fullest effect to a resolution which had lain dormant. Our relations with all the Geographical Societies of the Empire are becoming increasingly intimate, and these would of themselves be quite sufficient to force on certain improvements in our arrangements which must soon come about, thanks to the increasing progress of intelligence. The Provincial Societies are a sort of automatic recruiting ground, sending us new Fellows without any trouble on our part.

And new Fellows we most decidedly want, for our obligations are increasing. True, it is, that during the last four years we have made a very great increase. In the year 1889-90, when the excitement about Mr. Stanley's journey was running breast high, and when we had the great meeting in the Albert Hall, our net increase was one hundred and thirty-one; the next year, when there was no very special excitement, it was eighty-four. In 1891-2 we had a great many new elections, but the terrible influenza epidemic ran up our Obituary, and instead of an average of eighty we had one hundred and fourteen deaths. The result was a small net decrease, a decrease of twenty-three. This year, however, the tide has turned, and turned with a vengeance; we have a net increase of one hundred and forty-four gentlemen and twenty-two ladies, one hundred and sixty-six in all. In other words, during the four years in which I have had the honour to be your president, I have seen your numbers increased by three hundred and fifty-eight, and they are now close upon three thousand seven hundred; but we want them all and many more, for before long we shall have to take into the most serious consideration the acquisition of a new domicile. Our constantly increasing collections would of themselves, as I have pointed out before, ere long drive us from our present quarters, and we have, in addition, reason to believe that even if we could extend our borders where we now are, on anything like reasonable terms, which we cannot, certain changes in the streets in this part of the town would ere long improve us off the face of creation. Then, although the University of London has

been most kind to us in lending us their theatre, and although the character of our papers and of our publications, as well as our position as the leading geographical society of the world make us, I think, not unworthy recipients of the kindness of an university, whose operations extend over the whole of the British Empire, we cannot look forward to the present state of things continuing for an indefinite period. A vote of the Senate might at any time put an end to it.

We do, no doubt, more for the Government of this country by a very great deal than any other Society save the *doyen* of all societies, the Royal Society, but others, owing to historical reasons, had the good fortune to be accommodated in a Government building in which no room was found for us, and so we are thrown back upon our own resources. In default of finding a Mr. Tate amongst our Members we must eventually buy land for building purposes, and we have steadily been keeping this matter in view without arriving as yet at any definite result. Land in this part of the town is enormously costly, and, if we were to go to any other, we might easily lose some of the attractions and advantages which we are now able to offer to our Fellows.

I cannot help thinking that sooner or later some Government may recognise, in a practical form, the obligations which they all recognise in words, and give us some facilities such as Governments can give to public bodies without any burthen on the tax-payer. Still, our first duty is to help ourselves, and that, as you have just heard, we are doing by increasing our numbers. Nor must it be forgotten that since the commencement of this year the entrance fee has been increased without any prejudice to the number of our candidates.

Amongst the expeditions which we have aided in the course of the year have been those of Mr. Conway and Mr. Theodore Bent. You all know how well the first has succeeded, and ere long I doubt not that Mr. Bent will have a good deal to tell us of his travels in Abyssinia, whence he has just returned. Mr. Pratt, to whom we gave some assistance with a view to his intended explorations in the Valley of the Amazons, unhappily broke down in health and was unable to proceed with his work. Dr. Nansen has also received, as you are aware, some help from us. While he is making the final preparations for his start, various other proposals for Arctic exploration are being brought forward. One of these has for its author an Englishman, Mr. F. G. Jackson, who describes his intentions in the April number of our *Journal* in the following words:—

“The objects I have in view in my projected journey may be conveniently summarised under two heads: (1) The general exploration of Franz Josef Land, and in particular the discovery and mapping of its northern regions; the observation of the climatic conditions encountered; the recording of such geological evidence as is met with; and the

general investigation of the geographical conditions of the country. (2) An advance in a northerly direction, which shall be so far continued as to bring me within the immediate locality of the North Pole, and an endeavour, by all means in my power, to observe the geographical conditions at that mathematical point. Speaking generally, my plan may be described as an advance northward on land as far as such land continues—an advance which shall be made more secure and more open to retreat by the establishment of a series of depôts, reaching at intervals of about 100 miles from about the parallel of 80° to the most northern point of the land, or the locality of the North Pole, whichever shall be met with first."

Mr. Jackson adds:—

"Under the most favourable conditions—which I would assume to be the stretching of Franz Josef Land into the immediate regions of the Pole—we might achieve our objects, and return to the southern shores of Franz Josef Land in the late summer of 1894. At any rate, by the summer of 1895 I think we should have proved whether the Pole is practicable or not by the Franz Josef Land route, and be in a position to return to Europe. Thus we require two years in which to attain all our objects, or prove the impracticability of attaining one of them. In any case I shall endeavour, with all my power, to bring back a faithful report of the geographical conditions in a region of the Earth more northerly than any that has yet been observed or, indeed, reached."

These are large designs, and it would no doubt have been well if Mr. Jackson had made a preliminary journey, like that which carried Dr. Nansen across Greenland. He has not asked the Society for any assistance, but proposes to make his expedition entirely as a volunteer, and in no way under our auspices, though we wish well, of course, to him as to all other explorers.

Many of you are aware that a departmental committee was appointed by the Board of Agriculture in April, 1892, to examine into the work of the Ordnance Survey and various proposals which had been made for the improvement of the same. It examined more than thirty witnesses, and reported with special reference (1) to the steps which should be taken to expedite the completion and publication of the 1-inch maps of the British Isles; (2) to the permanent arrangement which should be made for the permanent revision of maps on various scales; (3) to the question whether the maps as at present issued satisfy the reasonable requirement of the public in regard to style of execution, form, information conveyed, and price, and whether any improvement could be made in the catalogue and indexes. Your Council made some recommendations to the Committee, and your Hon. Sec., Mr. Freshfield, appeared as a witness before it. The Committee, which was a strong one, accepted nearly all the recommendations, which comprised the speedy completion of the 1-inch

survey, frequent revision, better distinction of roads and footpaths, the delineation of the contours of the sea-bottom round the coast-line, the production of a new map in colours, the union around towns and in tourist districts of the existing sheets of the Ordnance Survey, done on the 6-inch and 1-inch scales, so as to form special maps for such districts in which all new cartographical improvements might be from time to time introduced.

If these recommendations are carried into effect—Parliament providing the necessary funds—much credit will, I think, be due to your Society, and more especially to Mr. Freshfield, who has devoted a great amount of labour to this matter, as he has indeed to everything connected with your affairs while I have had anything to do with them, and for many years before my period of office commenced.

OUR EDUCATIONAL WORK.

I went at great length last year into the subject of our educational work. It will be quite unnecessary accordingly to go back upon ground already traversed, and I will confine myself to noticing very briefly its new developments of the past year.

At Christmas 1892, Mr. Coles, our map curator, gave two lectures to an audience largely composed of young people, which were very well attended. On January 20th, 1893, Mr. Mackinder began a series of geographical lectures in this theatre, addressing himself chiefly to persons engaged in teaching geography. He continued these on the ten successive Fridays, taking as his subjects:—

The Relations of Geography to History.

The Roads to the Indies.

The Belt of Desert and Steppe.

The Gates of India and China.

The Approaches to Europe.

The History of Russia as a Commentary on its Geography.

The Alps as a Factor in European History.

The Approaches to Italy.

The Divisions of Gaul.

Some Geographical Analyses of British History.

Fellows of the Society were admitted free of charge, and could obtain tickets for members of their families at a fee of five shillings for each course.

The lectures were listened to by large audiences. At their conclusion Mr. Dyason moved and Mr. Fitch seconded a vote of thanks, which, proceeding as it did from the initiative of two gentlemen who speak with such authority upon educational matters, was of real importance.

Mr. Mackinder's work at Oxford continues to bring forth good fruit,

and has been recognised by the authorities there in a manner highly gratifying to himself as well as agreeable to our Society, by showing that its choice of a representative at Oxford has fallen upon a man of real merit.

Mr. Buchanan has continued his lectures at Cambridge, though I regret to say he has retired from the post. We hear from the Victoria University that Mr. Yule Oldham, whose appointment was the result of some communications to which I alluded last year, has been doing extremely well at Manchester in connection with the Geographical Society of that place and with ourselves.

Our sister Society of Liverpool, which started under the best auspices only last year, has had a pitiable loss in the premature death of its President, Lord Derby. His solicitors have intimated to us that he has left to the Royal Geographical Society a sum of £1000, an aid to our work agreeable in itself, but more agreeable in that it conveys the approbation of one of the best informed men, and, as I venture to think, far the wisest statesman who has taken part in the affairs of this Empire during the last thirty years.

Mr. Grundy, the first scholar we appointed in concert with the University of Oxford, made Greece the scene of his explorations. He surveyed, *inter alia*, the fields of Plataea and of Leuctra; but was prevented by extremely bad weather from doing a good deal that he intended. He proposes, however, to return and complete his work.

It will be gratifying to many to learn that so far as his researches at Plataea have hitherto gone, they have confirmed the accuracy of the "Father of History."

The studentship instituted by our Society and the University of Oxford, has been given to Mr. Cozens-Hardy of New College, who has taken the Eastern frontiers of Montenegro for his field of study, and, as I hope, of fame. He has already some acquaintance with that country, and may be expected to bring back a good deal of new knowledge.

I mentioned in my last address that we were in correspondence with the Scotch Education Department about the best means of encouraging geography in the Scotch Training Colleges, and it has been settled that we are to award prizes on the basis of the entrance examinations of pupil teachers; this arrangement being considered to be the most convenient by those who direct these institutions.

THE YEAR'S EXPLORATION.

In reviewing the work of the Society during the year—the work done at our ordinary meetings and the varied contents of our monthly journal—I have had, to some extent, to deal with the exploring activity of the past twelve months. Still there is much to refer to in order to give a fairly complete *resumé* of what has been done by exploring expeditions

to fill up the gaps in our maps, and of geographical activity in other directions. With this part of my subject I must deal briefly.

In connection with Mr. Markham's Paper I have referred to the fact that the past year was the fourth centenary of the discovery of America by Columbus. This epoch-making event was celebrated in various European countries, more especially in Spain and Genoa, where during the summer and autumn there was a continuous series of *fêtes*, congresses, and exhibitions. In other countries the occasion was commemorated in various ways. America also, in October last, manifested her sense of the importance of an event which initiated her remarkable career, but has reserved until the present year a much fuller recognition in the great exhibition at Chicago, which was opened in the beginning of May, and which in some respects will be the most remarkable exhibition the world has seen.

An event of considerable geographical importance is the completion, during the year, of the remeasurement of an arc of meridian decided on in France in 1869, and instituted after the war of 1870. The work included a variety of operations. It is now practically finished, and the French triangulation is connected by actual observation with the surveys of England and of Spain.

Dr. Schlichter's new photographic arrangement for taking celestial observations has been completed during the year. Its practicability has yet to be tested by actual work. This may be done by Mr. Campbell, who has taken a camera with him to Korea, where he intends to make another effort to reach the lake on the Great White Mountain.

Turning to the exploring work of the year, let us begin with the regions around the Poles. It was hoped that Lieutenant Peary would have come to England about this date, and given us an account of his interesting expedition to the north coast of Greenland from McCormick Bay by land. Unfortunately, he has had to give up his visit to Europe. His journey over the ice of the interior revealed somewhat the same conditions as were seen by himself on his former journey into the interior, and by Nansen when he crossed the ice-bound land. Lieutenant Peary reached the north coast to the south-east of the furthest point attained by Beaumont, and has thus confirmed the conjecture that that coast trends to the south-east. Lieutenant Peary contemplates another expedition to the same coast, partly with a view of further exploring it, and partly for the purpose of making it the point of departure for an attempt to push northwards. No precise date, however, seems to have been fixed for his departure.

Reference has already been made to Nansen's hazardous attempt to reach the Pole. Meantime, as I have already stated, Mr. Frederick Jackson, a young Englishman fired by the example of Nansen and Peary, has brought before the public a scheme for

pushing on to the Pole by Franz Josef Land. To this I have already referred.

Lieutenant Ryder's expedition to East Greenland, which returned to Denmark during the year, made important additions to our knowledge of that inhospitable coast, on which, as will be seen from the map published in the *Proceedings*, he discovered a magnificent series of fjords.

An interesting attempt, partly supported by the Society and by Mr. Leigh Smith, was made in the past year to add to our knowledge of the Antarctic. Four Dundee steam-whalers were equipped and sent to seek for whales and seals in the South Polar region. On board of them were three young men well qualified and well equipped to carry out scientific and geographical observations. The ships have just arrived, and detailed reports may be daily expected of what has been done for science. But as they did not reach far south, and as the skippers were more bent on seals than on science, it is to be feared that the harvest for geography will be somewhat disappointing.

Coming to Asia, I need only refer to the excellent work which continues to be accomplished by our Indian Survey, a report of which for the past year will be given in the August number of the *Journal*.

In dealing with the activity of the Society during the past session I have referred to the excellent work done by Mr. Conway and his companions in the region popularly known as the Karakoram; his expedition is an example of the kind of careful and minute work that now remains to be done over much of Asia, as of Africa and South America, where what we may call pioneer work has laid down the general features. A good example of the pioneer work is afforded by Captain Bower's journey, already dealt with.

In the summer of last year the Central Himalayas was the scene of an expedition under Dr. Diener, who was accompanied by Messrs. Griesbach and Middlemiss of the Indian Geological Survey. Naini-Tal was the starting-point, and the party penetrated as far as the little-known district of Hundes (Tibet) by way of the Kiangur and Khiogar Chaldu Passes, each over 17,000 feet. Several peaks were ascended, including Kungribingri (19,170 feet).

In Annam an excellent piece of survey work was accomplished last year by Dr. A. Yezin in the course of a journey from the Coast of Annam to the Mekong, across a hitherto unknown tract of country.

In the Eastern Caucasus last summer Herr Merzbacher did good work in exploring the lofty and comparatively isolated Tebulos and Bogos groups which separate Daghestan from the country of the Chevsurs and Tushets in the south, and the Bogos range in Daghestan. He ascended about a dozen lofty peaks, including Ararat.

As in past years, Africa continues to bulk more largely than any other continent in the summary of the year's exploring work.

I have already referred to Captain Lugard's work in Central Africa, but for the sake of completeness let me repeat that during the expeditions which he conducted from Uganda as a centre, and from which he returned during the past year, he did much to add to and give precision to our knowledge of the whole region.

In the summer of last year an expedition left England for East Africa of which much is expected. It is under the leadership of Mr Astor Chanler, a wealthy young American, who, while fond of sport, has a real interest in exploration. He is accompanied by an Austrian officer, Lieutenant Von Höhnelt, who has already done good service in the region to the east and north-east of Lake Victoria. From information which has reached us, the expedition has already done valuable work in the region to the east of Mount Kenia, watered by the Tana River, and is now probably pushing its way into the region lying to the north of Kenia.

The expedition to the Jub River, associated with the name of Lieutenant C. H. Villiers, and from which much was expected, unfortunately fell to pieces before it was well under way. Fortunately, one of its members, Mr. J. W. Gregory, of the Geological Department of the British Museum, has determined to do some work before returning home. By the latest news he had proceeded by himself, with only a few natives with him, to Mount Kenia. It is to be hoped he will reach his goal, for so trained a scientific observer must bring back valuable results.

Several rumours have come out of the darkness which still hangs over Central Africa as to the death of Emin Pasha. No precise information has yet reached us, and Emin has been so often slain that until more positive evidence comes to hand, we must hope that he is still alive. When last heard of he was making his way through the Ituri forests towards either the Congo or the Cameroons. As far as Lake Albert, Emin was accompanied by Dr. Stuhlmann, a qualified scientific observer, and the account which he has contributed of their joint travels and of his own observations on his return journey to Lake Victoria, form valuable contributions to the hydrography more especially of the great inter-lake region. Even more important have been the journeys of Dr. Baumann on the south-east and east of Lake Victoria. Here he has been able to place upon our maps a new and interesting lake, adduce evidences of volcanic activity, and fill in considerable gaps in our knowledge of a region having many interests. Dr. Baumann is an admirable example of the thoroughly-trained scientific explorer. Equally fruitful in results has been the journey which Dr. Baumann has accomplished between Victoria Nyanza and Tanganyika,

the first time such a journey has been made. From the north end of the lake Dr. Baumann proceeded south-east to the station of Tabora. Near the source of the Kagera he found a wooded mountain range known as Mesozi a Mivezi, our old friends the "Mountains of the Moon," which forms the watershed between the Nile and the Rufizi, which flows into Lake Tanganyika.

French explorers have been doing excellent work in Africa during the past year. The journey of Captain Monteil is a remarkable one. He entered Africa from Senegal, crossed the great bend of the Niger to Say, entered Sokoto and Bornu, where he was well received, saw Lake Chad and traversed the Sahara to Tripoli. Details of this interesting journey have not yet been published; but Captain Monteil cannot have failed to add considerably to our knowledge of the region on the borders of Lake Chad, which have not been visited by Europeans for many years.

Another French explorer, M. Maistre, starting from the Congo, and taking a route to the east of that of the unfortunate Crampel, passed through Bagirmi and reached the River Shari, coming out by the Binue and Niger. He also struck new or little-known ground, and the full report of his expedition will be looked for with interest. M. Maistre followed in the tracks of M. Dybowski, who went out to trace the remains of the Crampel expedition, and who also reached the upper course of the Shari. Through all the region M. Maistre searched in vain for Lake Liba, which has so long found a place in our maps.

Great interest has been excited in geographical circles during the past year by the extensive journeys accomplished by the expeditions sent out by the Katanga Company into the Congo Free State. They were under the command of M. Delcommune, M. Bia, and Captain Stairs. Generally, it may be said, they have resulted in most important additions to a knowledge of the hydrography of the extensive region watered by the great rivers that contribute to the formation of the Congo, the Unapula, the Lualaba, and their numerous affluents, as well as of the lakes that mark their course. Unfortunately the work cost the lives of, among others, Captain Bia and Captain Stairs.

Further north, another life has been sacrificed to the enterprise of the Congo Free State, that of M. Van den Kerckhoven, the leader of a great expedition to the Upper Nile, about whose aims and work we are, however, very ignorant. In another part of Africa the famous French explorer, Captain Binger, has added to the services already rendered by exploring the Gold Coast interior from Bonduku to Kong. In German South-west Africa, Count Pfeil accomplished a journey, during the past year, from the Orange River on the south, through the east and the centre of Namaqualand and Damaraland, during which, as a trained scientific observer, he was able to add much to what we knew already of the geography and capabilities of the country. The results of Count Pfeil's

journey will be given in an early number of the *Journal*. The Germans have also been continuing the work of exploration in the Cameroons, though that colony does not seem to be progressing as satisfactorily as might be wished.

Major Leveson and Senhor Ennes, the English and Portuguese deputies* for the delimitation of the territories of the British South Africa Company and those claimed by Portugal, have completed their work. The result has been the careful exploration and mapping of a strip of land some portions of which were quite unknown. The result of this will be given in an early number of the *Journal*.

Mr. Selous has told us of his own recent work in Mashonaland. The Company's surveyors and pioneers are continually adding others, and during the year not a few of the meshes in the network of pioneer routes have been filled up.

Mr. Joseph Thomson's important journey across the plateau between Lakes Nyasa and Tanganyika was supplemented during the past year by a journey made by Mr. Sharpe (one of Mr. H. H. Johnston's Vice-Consuls) from Lake Nyasa to Lake Tanganyika, and thence to Lake Mweru and the capital of Cazembe. Mr. Sharpe has rectified our knowledge of the lake and added some fresh information concerning the region which surrounds it. In other directions Mr. Johnston and his staff have been increasing our knowledge of the region which he administers. One member of his staff, Lieutenant Selater, has just returned to England, after having nearly completed a road from the Lower to the Upper Shiré.

Mr. Theodore Bent's expedition to Abyssinia for the purpose of investigating the ruins of Axsum has not been so successful as might have been wished, owing to the hostilities which are being carried on between two of the chiefs; indeed, he and Mrs. Bent had a narrow escape from being involved in their hostilities. Still, the expedition has not been altogether without interesting results.

Mr. Cecil Rhodes's great scheme of a Central Africa telegraph from the Cape to Cairo is a project of some interest to geographers. It may be recalled that a similar scheme was brought before the Society some fifteen years ago, and that the late Colonel Grant took much interest in it.

A controversy has been carried on during the year under review between Dr. Schlichter and Mr. Swan (Mr. Bent's companion in Mashonaland), with reference to the astronomical relations and symbolical significance of the famous Zimbabwe ruins. The general conclusion to be drawn is that we want more details and more precise information before we are justified in building any theories on these remarkable remains.

In South America valuable contributions have been made during the year to a knowledge both of the lowlands and highlands of Ecuador by

Dr. Wolf, who acted for some years as government geologist in that country.

Considerable additions have been made to our knowledge of Patagonia by Dr. Siemiradzki, whose maps and narratives have only quite recently been issued at Gotha. These fill up a large blank in a country which, though it has been the field of official expeditions, still is very imperfectly known.

In Australia we have had the results of the expedition to the centre of the continent, sent out by Sir Thomas Elder, under Mr. Lindsay. Although the expedition was a failure on the whole, still it is evident from the maps and reports that something was done to fill up the great blank which still remains. Mr. Guy Boothby, himself a native of Australia, has just arrived in this country, after having crossed the continent from the north of York Peninsula, down through Queensland into Victoria. It remains to be seen whether Mr. Boothby has achieved any original results.

In New Guinea and the neighbouring islands, the administrator, Sir William Macgregor, continues to occupy himself busily in acquiring a knowledge of the geography and resources of the region under his care. His last annual report is as voluminous and instructive as usual.

I am indebted to the Hydrographer, Captain W. J. L. Wharton, for the following summary of the admirable work accomplished by the Admiralty during the year:

ADMIRALTY SURVEYS.

Under the orders of the Lords Commissioners of the Admiralty there have been employed in hydrographical surveys in various parts of the world seven steam-vessels of war and two hired vessels, with crews consisting of sixty-six officers and six hundred and twenty-seven men. Under the Government of India there has been one steam-vessel employed on the coasts and dependencies of India; while a small steam-vessel under the orders of the Dominion Government of Canada has been engaged on the inland waters adjacent to Canada.

The several localities where these surveying vessels have been actively engaged are as follows:—The shores of Great Britain and Ireland, Nova Scotia, Anticosti Island; Africa, east coast; Greece, west coast; China; Borneo, Australia, and the New Hebrides. A full report of the work executed by each vessel has been presented to Parliament in accordance with annual custom; but the following is a summary of what has been accomplished:—

On the shores of Great Britain, a re-survey of Southampton Water on a large scale was commenced and completed. An examination was made of the Shipwash and other shoals in the approach to Harwich, and the result proved that considerable changes had taken place in the position and depth of water on most of the shoals examined, the tendency of the outer shoals being to extend to the north-eastward. In the North Sea, off the Humber, an area of 242 square miles to the northward of that portion completed during 1890 and previous years was well sounded out, but no shoals or dangers to navigation were discovered. A survey of Bridlington Bay revealed the fact that great alterations had taken place on Smithic Shoal; the

greater portion of the northern part has been washed away, while the southern part is much shoaler. In the Thames, an examination of the Shingles Patch in the Duke of Edinburgh Channel showed that the depth on it had decreased 3 feet since the last examination in April 1891.

At the northern entrance to Menai Strait, the shoals and channels at the head of Beaumaris Bay were re-surveyed, and considerable alterations found to have taken place since the previous survey in 1872. The southern portion of Carnarvon Bay was sounded out to the 30 fathoms contour, and the southern entrance to the Menai Strait completely surveyed.

On the west coast of Scotland, Kerrera Sound and the north approach to Oban were surveyed on a scale of 10 inches to the mile, completing the work commenced in the previous year.

Off the north coast of Ireland, a large area was examined with a view of obtaining more detailed knowledge of the depths off the coast, so as to form a guide in thick weather to shipping approaching the Irish Channel from seaward. No dangers to navigation were discovered, but several inequalities of the bottom that might much deceive a shipmaster as to his position were charted.

The work on foreign and colonial shores has been as follows:—

In Nova Scotia, the outer part of Halifax Harbour with its approaches was surveyed, and though no new dangers were discovered, yet the known shoals were found to have less water over them than hitherto shown on the charts. A fisherman of Newfoundland having reported the existence of a shoal patch off Cape Race, an examination of the spot was made, when the least water found on this shoal—called Nickerson Bank—was 10½ fathoms, the position being 17¼ miles west-south-west of Cape Race lighthouse.

A survey of the east coast of Anticosti Island was taken in hand in consequence of frequent reports that dangers extended farther from the shore than marked on the charts. About fourteen weeks were spent in a detailed survey extending from Table Head round the east point to Jupiter River, a distance of 56 miles: but the result proved that the dangers, instead of being farther off shore, are not so far as charted.

The survey of the coasts of the British East African territories was continued from the work of the preceding season, and completed from Ras Ngomeni to Lamu Bay. A plan of Lamu bar and harbour was also made.

The difference of longitude between Aden and Perim was determined by means of the electric telegraph, and a search made for a shoal in the northern entrance to the Massawa Channel on which the S.S. *King Arthur* is reported to have struck, but without finding any danger.

On the west coast of Greece a detailed survey was made of that much indented shore-line with off-lying islands between Scropha Point at the entrance to Patras Gulf and Astoko in Dragomesti Bay. A plan of the harbours of Pandelomona and Platea was also executed. During the progress of this survey a dangerous pinnacle rock (now called Day Rock) standing in 20 fathoms with only 26 feet of water over it, was discovered in the fairway off Port Platea, and it is fortunate that none of our deep-draught ironclads have struck it when making use of this channel.

In the China Sea, a careful search was made for the Hossack shoal in the vicinity of the Pratas. In spite of unpropitious weather, an area of 900 square miles was sounded out as closely as circumstances would permit, but no indications of any such danger as reported could be found.

The Macclesfield bank, a submerged coral atoll lying in the middle of the China Sea, is frequently crossed by vessels on their way from Singapore to Hong Kong.

A vague tradition of dangerously shallow water somewhere on its circumference of 180 miles has existed for many years, and the report by a P & O vessel in 1891 of a shallow cast, caused an examination of it to be ordered. A detailed examination was made of the western half of the rim, and in several places it was found that there was only from 6 to 10 fathoms of water; but the shoalest spot found was on a small coral patch near the centre of the lagoon, which was only covered by 5 fathoms of water.

A series of dredgings were taken nearly every day on the outside slope and inside the rim of this atoll, and the results examined by Dr. Bassett Smith, surgeon of the vessel. His report on the collection of corals, etc., thus obtained has been published by the Hydrographic Department, and the specimens forwarded to the Admiralty have been presented to the British Museum.

The Anamba Islands, a group of which very little is known, lies near the steamship route in the southern end of the China Sea. A detailed survey of them was commenced, but not completed before the close of the outdoor season.

On the north-east coast of British North Borneo, the survey was prosecuted from where it had been discontinued the previous season, and completed from Dent Haven to the boundary between English and Dutch possessions in $4^{\circ} 10'$ north latitude. During the progress of this much-required survey a large number of reefs and small islets were charted, while several dangerous rocks and shoals were also discovered.

On the completion of this work and when passing through the South Banguay Channel, the surveying vessel discovered a small pinnacle of coral in the middle of the fairway with only 10 feet of water over it. Considering that steamers have been using this passage regularly for some years it seems marvellous that a wreck has not taken place on such an unexpected danger.

On the east coast of China the survey of the southern part of the Chusan Archipelago, in continuation of the work done by H.M.S. *Rambler* in 1890, was completed. This survey embraced the whole of the area between the Yung River and the Kueshan Islands, including the western part of the Chusan Islands. Large scale plans of the Yung River and Sheipu Roads were also made. Further observations on the bore of the Tsein Tang Kiang were also made and many photographs taken, but nothing new was ascertained regarding the main features of the phenomenon.

In Australia the detailed examination of the inner passage between the Barrier Reef and Queensland coast was continued between Cape Grenville and Orfordness, and a distance of 65 miles completed. Considering the necessity of a very careful search for the small coral patches which are invisible until close upon them, progress in this survey must necessarily be slow.

In the New Hebrides, the survey was continued from the preceding season's work; the north and east coasts of Mallicolo Island were completed, and also the southern shores of Espirita Santo; besides plans of Second Channel, Malo Pass, Baldwin Cove, and Tangoa.

Besides the work done by the regular surveying vessels, the officers of H.M. ships have sent in many sketches and plans of harbours and anchorages which are a great assistance in improving the charts. Deep-sea soundings have also been obtained by the vessels belonging to the various telegraph companies, which greatly improve our knowledge of the formation of the ocean bottoms.

The surveys carried on under the orders of the Indian Government include a survey of the east coast of Hindustan from the central mouth of the Godavari River to False Divi Point, the soundings being carried out to the 100-fathom line, which is on an average 13 miles from the shore; also a plan of Masulipatam Roads. The

Lakadivh Islands were visited, the positions of some of them determined, and surveys made of Cardamum and Ancutta Islands, Betra Par, and Pere Mul Par Reefs.

In Canada the survey of the eastern shores of Georgian Bay, Lake Huron, was continued from Moose Deer Point to Waubauskene, including the Christian Islands. The survey of Parry Sound, which had been commenced the previous season, was also completed.

During the year the Hydrographic Department has published sixty-nine new charts and plans, and ten plates have been improved by the addition of fifteen new plans. One hundred and sixty-two plates have been largely improved by corrections and additions, while 4296 corrections have been made to plates by the engraver.

OBITUARY OF THE YEAR.

Our losses by death, though not so lamentably numerous as last year, have been great enough, as will be seen from the following list:—

ISRAEL ABRAHAMS; JOHN R. ANDREWS; HENRY MC. L. BACKLER; JOHN BARTHOLOMEW; General Sir HENRY BATES, K.C.B.; JOHN CHARLES BELL; Very Rev. EDWARD BICKERSTETH, D.D. (Dean of Lichfield); FREDERICK W. BIGGE; Capt. B. H. H. BIRCHILL; FRANCIS BLACK; FREDERICK ELLIOT BLACKSTONE; Dr. JAMES BRIGHT, M.D.; Capt. A. T. BROOKE, R.N.; Dr. HERMANN BURMEISTER (Honorary Corresponding Member); HIGFORD BURR; JAMES CAMPBELL, R.N.; R. RUSSELL CAREW; W. C. S. CARMICHAEL; Sir CHARLES CLIFFORD, Bart.; Major O. Y. COCKES; AUGUSTUS COOPER; General S. WYLIE CRAWFORD; T. M. CROWDER; Lord DERAMORE; Right Hon. Earl of DERBY, K.G., LL.D., D.C.L.; Rev. GEORGE DE VITRE, M.A.; GEORGE DUNCAN; Sir THOMAS WILLIAM EVANS, Bart.; H. W. FREELAND; BARTLE JNO. LAURIE FRERE; General ALBERT FYTCHE, C.S.I.; THOMAS RANNIE GRANT; Col. GEORGE EDWARD GROVER, R.E.; Sir R. W. HARLEY; ANDREW HAY; AUGUSTUS ALLEN HAYES; E. H. HEWETT; ALFRED HICKS; E. W. HUMPHREYS; F. H. WARD JACKSON; H. BERKELEY JAMES; R. CASTLE JENKINS; WILLIAM JENNINGS; Hon. W. NASSAU JOCELYN, C.B.; JOSEPH KIPS; ANDREW JAMES LIVINGSTON LEARMONTH; JOHN DUNKIN LEE; Earl of LICHFIELD: JOHN MACGREGOR; JOHN MACKINLAY; CHARLES MALLETT; Admiral RICHARD CHARLES MAYNE, C.B.; JOHN H. MORANT; D. L. MORGAN, C.B. (Inspector-General, R.N.); PHILIP A. MYBURGH; Lieut.-Col. FRANCIS NEWDIGATE (Coldstream Guards); ROBERT C. NICHOLS; D. R. PEACOCK; JOHN HENRY PLOWES; SAMUEL PROCTOR; Captain JOHN COMPTON PYNE; JOHN RAMSAY (of Islay, N.B.); ANDREW H. REED; J. BRINSLEY RICHARDS; JOHN LAMBE RIGDEN; DAVID ROSS; A. V. NURSING ROW; JOHN ST. CLAIR; Captain CHARLES W. SELWYN, M.P.; General SHDANOF (Honorary Corresponding Member); ELI LEMON SHELDON; Captain W. G. STAIRS; COLLARD JOSEPH STOCK; General CHARLES STUART; The Duke of SUTHERLAND; N. J. R. SWART; FRANK TAYLER; Dr. A. BOYLE THOMPSON; JOHN VINCENT; HUBERT FOVEAUX WEISS; Captain Sir WILLIAM WISEMAN, Bart., R.N.

REPORTS ON GEOGRAPHY AT THE UNIVERSITIES.

To the Council of the Royal Geographical Society.

OXFORD, May 19th, 1893.

I have given my usual lectures during the past academical year, but have somewhat re-arranged the grouping of subjects. Instead of

devoting half of my lectures in each term to Historical and half to Physical Geography, I have given all my attention in the Michaelmas and Lent Terms to the students in the History School, reserving the Summer Term for students of Natural Science. The effect has been to secure a large class for two-thirds of my lectures in place of half.

The attendance of graduates and undergraduates reading for honours in Modern History was as follows: In Michaelmas Term, sixty-one men from fifteen colleges; in Lent Term, forty-four men from eleven colleges. In addition, there were in Michaelmas Term, twenty-six lady students from three halls; in Lent Term, eighteen from three halls. These attendances are considerably larger than any which I have yet been able to record, and they become the more encouraging when it is remembered that the lectures were delivered twice a week instead of once, as in previous years.

I regret to say that as yet there is no similar increase in the demand for Physical Geography. I have only had the opportunity of giving a little instruction in that subject to one undergraduate and two or three ladies.

It is a great pleasure to be able to report the successful efforts of a colleague in the geographical field. During the present term Mr. Hogarth, of Magdalen College, has delivered a few lectures introductory to Ancient Geography, and they have been largely attended.

Altogether I feel justified in saying that there are indications of a drift of thought towards the geographical side of several of the subjects studied at Oxford. I base this opinion not merely on the statistics which I have given, but also on many small observations, individually of too little importance to be enumerated here.

I have received, as additions to our apparatus, from the Berlin Geographical Society a copy, in sheet, of Kretschmer's great atlas; and from the United States Geological Survey nearly one hundred maps of different types.

In March the Electors appointed to the University Geographical Studentship for the current year Mr. W. H. Cozens-Hardy, B.A., of New College. Mr. Hardy will devote his investigations to portions of Montenegro and Albania. He has already travelled in neighbouring districts, and has the great advantage of speaking the Serb language. The student of 1892, Mr. G. B. Grundy of Brasenose College, has done some good work in Boeotia. I believe that his report and maps will shortly be published by the Society. It may not be out of place to mention the fact that Mr. Grundy has recently been appointed to the head-mastership of the Oxford Military College at Cowley.

In company with Dr. Mill, I again examined in geography for the commercial and lower certificates of the Oxford and Cambridge Board. There was a marked improvement in the work done for the former, and many indications of more careful teaching.

Turning now to the geographical teaching which I have been able to give outside Oxford, I have to report, in the first place, eighteen lectures at Winchester, Southampton, and Lyndhurst in connection with the Oxford University Extension. This is but a small remnant of the work of this kind which I did in former years; but I am happy to say that other lecturers are already coming forward to take my place.

At the Reading University Extension College I have had the opportunity of superintending classes for pupil and assistant teachers, and so learning the conditions of geographical instruction in a most important department of our national system of education.

Lastly, in January, February, and March I gave in London the course of educational lectures recently instituted by the Society. My subject was "The Relations of Geography to History in Europe and Asia." The audience consisted of about two hundred persons, mostly teachers of various grades, who attended the whole course with the utmost regularity. Though no examination was held to test results, I have reason to believe that the students grasped the ideas which it was attempted to convey to them, and that as they came from all parts of London, the effects of the Society's action were probably felt by a large number of pupils not present at the lectures. I should like to mention the great help which I received from Mr. Darbishire in the preparation of the slide-maps, without which the illustration of my lectures would have presented great difficulties.

H. J. MACKINDER, M.A., Reader in Geography.

To the Council of the Royal Geographical Society.

CAMBRIDGE, May 7th, 1893.

THE lectures this year have been devoted to *Oceanography*, or the Physical Geography of the Sea. In the first term the subject was treated from a *statical* point of view: particular attention being given to the permanent features, such as the distribution and characteristics of the beds of the oceans and minor seas, and the temperature and climate of their deeper waters, which depend largely on the configuration of their beds. In the second the subject has been approached from the *kinetic* point of view: particular attention being paid to the features of the ocean involving change and motion. It is mainly devoted to oceanic circulation.

In the Michaelmas term the attendance at the lectures was very satisfactory, and one student attended the laboratory for practical work. The attendance in the present term is not so favourable, which is no doubt due to the proximity of the examinations.

The room in the New Museums, which has been fitted up as a geographical laboratory, has already been taken advantage of by one or two students, and continuous work is being done in it by my assistant, Mr. Heawood. When it is better known it is hoped that original work may be produced in it by students, which may merit the bestowal of the prizes provided by the liberality of the Society.

J. Y. BUCHANAN, F.R.S.

To the Council of the Royal Geographical Society.

OWENS COLLEGE, MANCHESTER.

May 25th, 1893.

I beg to submit a report of the results of my first year's work in connection with the geographical lectureship founded here by the Royal Geographical Society in conjunction with the Manchester Geographical Society.

After entering on my duties at Easter in last year, I lectured, until the end of the Summer Term, three times a week, giving a short introductory course, followed by a longer one on the British Empire. These lectures were attended by forty-five students of the Day Training College, to whose requirements they were adapted. Some of the interesting features of the Peak district were also visited.

In the winter I gave a course of ten evening lectures on some of the economic aspects of geography, which sixteen students attended—a good attendance for an evening class.

For the Victoria University Extension I gave thirty-six lectures at the following centres:—Gorton, Leigh, Lytham, Moston, and Withington. All of these were well attended by audiences ranging from one to three hundred. I also gave two courses of six lectures each at the Storey Institute, Lancaster, and University College, Liverpool; and in addition single lectures at several places, including Wolverhampton and Oldham, to audiences exceeding one thousand.

My work has been much hampered by the almost total absence of maps and other necessities; but, notwithstanding, a fair beginning has been made, the unstinted loan of material belonging to the Manchester Geographical Society having proved of no little value.

I would only add that the indications of the second year's work have so far been promising.

H. YULE OLDHAM, M.A.

SOUTH-WEST AFRICA, ENGLISH AND GERMAN.*(From an economical point of view.)*

By JOACHIM COUNT PFEIL.

THE development of a country's resources, commercial or otherwise, depends chiefly upon its physical qualities and its inhabitants, and extends mainly in two directions—the utilisation of the soil, on or below its surface and the vegetation which covers it, or the establishment of trade with the peoples of the country. As the inhabitants of a country are to a very great extent affected by its physical condition, it may be said that on it the establishment of trade in the end depends. As, however, climatic influence is a very slow factor when applied to human beings, we shall not stop to reflect how far traits in the character of our natives may be traceable to it, but merely consider in what measure it modifies our method of dealing with the physical resources of the country. The native we shall treat as a separate factor in the development of the country, and as entirely unconnected with the physical qualities of the latter.

My journey (which was made in 1892) began at Port Nolloth, a little place on the west coast of Africa, in about $29^{\circ} 18'$ S. lat. I then went to the little mining town of Ookiep, and proceeded thence nearly northward to the Orange River. I then proceeded nearly east, parallel with the river, but some little distance south of it, till I turned north again and crossed it at a place called Schuitdrift, or "Stolzenfels." The former name signifies a ford, which is crossed by means of punts; the latter is the name of a famous castle on the Rhine, and has been given to the place by a German settler, who owns a large tract of country near the "Drift."

From the river I proceeded in a north-easterly direction until I reached "Burghers Dam," $19^{\circ} 38'$ E. long., from which place I turned south-east to pay a visit to the little town of Upington. I returned to Burghers Dam and then went north and north-west until I reached the German settlement of Windhoek, Jonker Africander's former stronghold, which is situated in about $22^{\circ} 35'$ S. lat. I then turned west, and proceeded in a nearly straight line to the mouth of the River Swakob, and from Walfisch Bay I returned to Cape Town by sea.

The country I traversed varies considerably when looked upon with respect to its development. The sportsman or tourist would probably complain of its monotonous aspect and its apparent want of water and vegetation.

Port Nolloth ought not to be called a harbour. It is merely an open "offing," which only affords anchorage at considerable distance from the coast, and hardly any protection from the prevailing winds. All

loading of vessels has to be effected by means of lighters in fair weather, and becomes quite impossible when the south-west wind blows hard. There are but few houses in Port Nolloth; they form one side of the only street in the place. On the other side, and at the back of the houses, begins the deep desert sand. This belt of sand extends all along the coast, and may be looked upon as the beginning of a zone of arid territory which trends northward, assumes much broader dimensions on the northern banks of the Orange River, and an almost terrible extent and character much farther north. The Swakob River may be called the northern boundary of this belt of sand, though even beyond this a good deal of arid country is still met with. What chances for utilisation the Kaoko, the district which now follows in the north, offers we do not yet know.

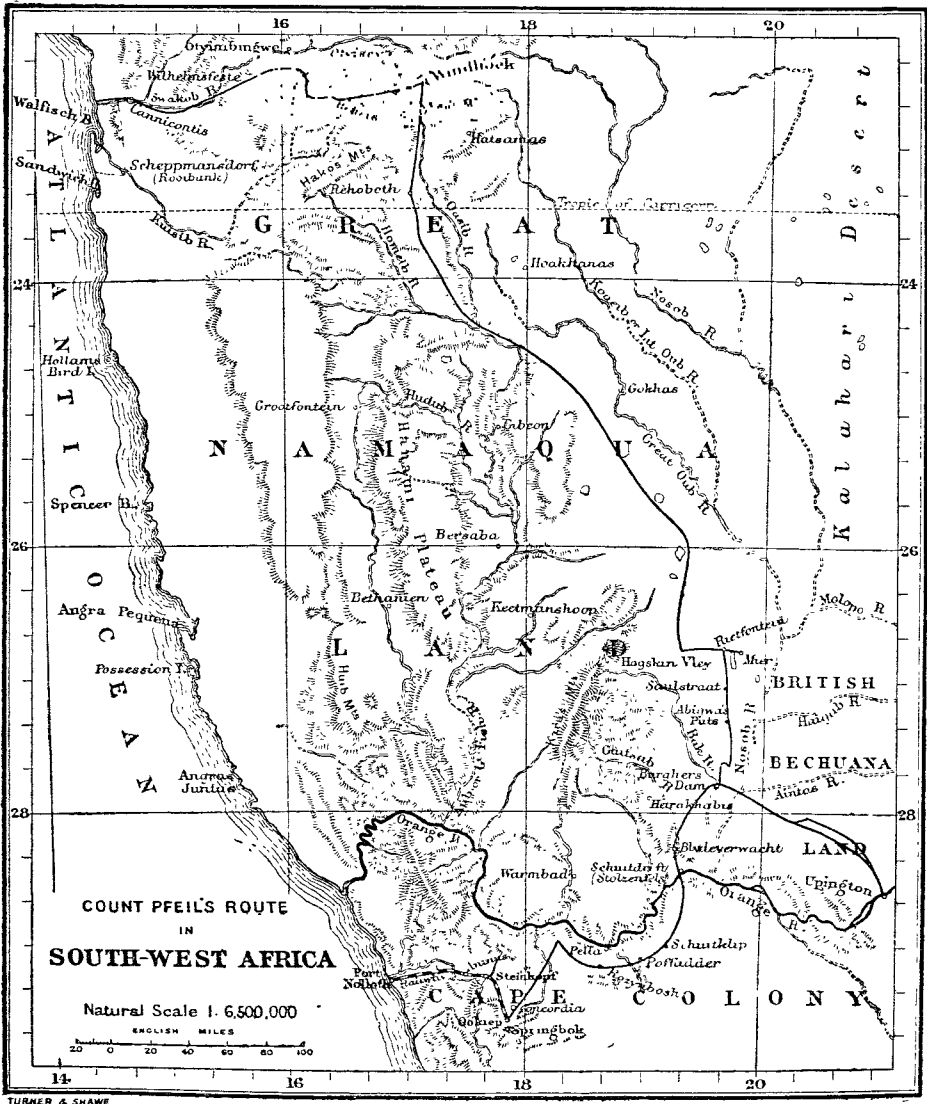
In former years the country about Port Nolloth did not offend the eye by its nakedness. What is now loose sand was then much firmer, and covered with little bushes called "Veigebosjes" in the Cape dialect. The opening of the Ookiep mine called considerable traffic into life, and great numbers of ox-waggon, accompanied by the necessary natives, daily passed between the two places. These natives uprooted all the little bushes round Port Nolloth for miles to use them as fuel, of which there was no other supply. The soil was thus denuded of its protecting cover, and sun and wind dried up the surface, which, unable to retain moisture, could no longer develop the germ of life in the seeds which still remained, or in those which found their way there.

As the process of denudation spread wider, desiccation penetrated deeper and killed the remaining roots, which might otherwise have replaced the former growth. What had formerly been a very light soil, was turned into worthless sand and became subject to the action of wind and tide. Once set in motion by both these agencies, it began to encroach on its surroundings, and soon silted up what had formerly been a clear rocky beach. This is proved by the fact that a jetty built out into the sea is now almost swallowed up by the sand, whereas in former years a man on horseback could cross under it at full speed. Since the building of the narrow gauge railway which connects Port Nolloth and Ookiep, the waggon traffic has disappeared, and with it the natives who destroyed the bushes. There seems, however, to be no chance that the latter should reappear.

The managers of the mining camp very kindly placed a so-called "special" at my service, and in this very comfortable little carriage I proceeded inland. A drive of very few miles took me out of the sand into a region showing a gradually-increasing vegetation, which, when we had nearly ascended, the Ookiep plateau merged into one of the grandest sights that can delight the senses of the travelling naturalist.

The scenery near Klipfontein is rugged and picturesque. Trees there are hardly any; but the whole country was at that time of year

(in June) covered with a multitude of flowers, the golden-red colour of which prevailed to such an extent that only where human labour had destroyed the gorgeous covering, or where the bare hard rock had repulsed the embellishing hand of nature, green and grey tints showed



the colour of the garment, on which the flowers worked the most graceful embroidery. A lovely scent, like that of a cottager's little garden, filled the air, which was alive with the hum of wild bees. From what an old settler in this place told me, it would seem that in

different seasons of the year different flowers appear; so that had I come earlier or later, I might have seen the hills covered by a carpet of a white or bluish hue, instead of the golden-red which now delighted my heart and charmed my senses.

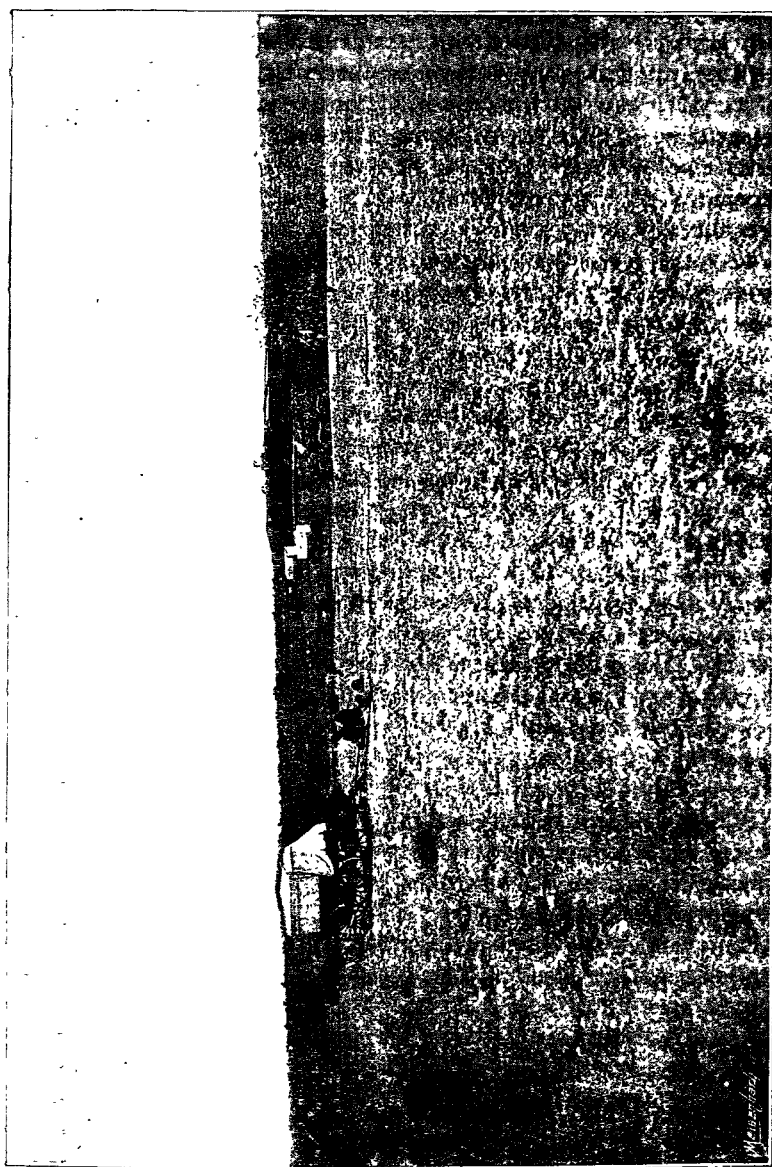
At a place called "Aninus" we had left our engine and train and harnessed six mules to our "special" without suffering a diminution of speed. Many curves and some bold viaducts led us to the top of the plateau, which we reached at Steinkopf at an elevation of about 3000 feet. Vegetation grows scarce again, and water, of which we had seen a small rill here and there among the hills, seems to disappear entirely. A student of geology would find this part of the country very interesting, and, perhaps, still more puzzling. All our ideas of strata and layers seem to be at fault here. I had no chance to stop in order to examine some of the cases; but had a general impression that the usual order of things is entirely subverted, and the oldest formations are found on top of more recent ones.

The scarcity of water continues, and even at Ookiep there is no natural supply; but the water is brought into the place from some considerable distance by means of pipes.

The miners of Ookiep are too well known to require notice. They have been the means of developing the surrounding part of the country, which, without them, would, in all probability, still be the home of wild game and still wilder bushmen, neither of which are now often met with. One fact alone deserves notice. Although all victuals—with the exception of meat—have to be brought from Cape-town, and command very high prices on account of the great distance and difficulty of transport, yet has no one in the neighbourhood attempted to grow vegetables or grain of any kind. The good prices which could be realised for products of all kinds make the fact that they are not being produced all the more remarkable.

The Boer farmer is no agriculturist; but this does not account for the want of agriculture. English farmers would readily till the ground could they see their way to make it pay. Even if we admit that their attention has not been directed to this part of the country yet, it would appear strange if the clear-sighted manager of the mine had not recognised and tried to relieve the want. The only reason we can find is, that it probably cannot be carried on. There is, it is true, but little water—hardly enough to serve for irrigation purposes, and not a sufficient rainfall, it seems, to make agriculture independent of irrigation. Furthermore, the soil appears to be very poor, and the country so rugged, that only in very few places an area large and level enough to invite cultivation might be found.

Going north we find that the country changes. It grows more level, and the rugged broken hills give way to solitary round hillocks, or low connected ranges. These are perfectly bare of vegetation, and



A FARM IN NAMAQUALAND.

the red colour of the gneiss, of which they are composed, imparts a peculiar character and fine desert tints to the otherwise uninviting landscape. The deep sand prevents a rich vegetation, and only allows a scanty growth of grass tufts which, in spite of being coarse and hard, supply amply a favourite food to the cattle.

On nearing the Orange River we notice tall, isolated, conical peaks, of very bright deep-black basalt. They form excellent landmarks, but seem to be confined to this part of the country. Another peculiar feature of the landscape strikes the observant traveller. After leaving Wortel we pass a rather hilly district, in which all the hills are almost entirely composed of quartz. As there is comparatively little vegetation, the white colour of the stone reflects the glaring sunlight and dazzles the eye, which soon wearies of so much intense brightness.

Shortly before reaching Rozynebosh the quartz disappears, nor do we see much of it again as a distinguishing characteristic. Beyond Rozynebosh another feature claims our attention. We descend a long slope, and reach the bottom of a shallow valley at Annakoppe, where the ascent of the other side begins. For hours the heavy waggon toils through the deep sand. The end of the rise appears quite close, yet when the spot where we expected to find it is reached, we see that it is again quite near to us, but still again a little farther on. Of these immensely wide, shallow depressions we have two. The first terminates at Poffadder, behind which the second begins; of this we reach the end at Schuitklip, which is an outspanning place, because it is for miles the only water-reservoir. The name signifies a stone like a "schuit," which is Dutch for "large boat." It is very appropriately given, because in the stone at this place a hole has been hollowed out by natural agencies exactly like a boat of very old-fashioned shape. As a rule, this cavity contains sufficient rain-water to water the draught oxen. When I passed it there was none, and my oxen, already for more than twenty-four hours without water, had to push on to the next place, which was more than ten hours distant.

The part of the country adjoining the Orange River is very badly supplied with water. Hardly anywhere does it rise to the surface, and at most of the places where white people have settled, they have been obliged to raise it by artificial means. In employing these, people have often suffered disappointment; when, after sinking wells of some depth, water was at last reached, it proved so salt that neither people nor animals could drink it, and plants when watered with it commenced to droop.

The whole country seems to be impregnated with kali. The estuaries of the Orange River are so filled with it that in many places their beds present the appearance of being covered with snow. Though perfectly dry, they sometimes contain a little water, which is intensely

bitter and salt. I was told of a pure saline spring, but could not fix its precise locality.

From the comparatively level country through which we had been travelling hitherto, we descended into the Orange River valley, which gives the impression as though an immense volume of water, sweeping across the country at a terrific rate, had worked out a deep ravine along its course, carrying away all the softer portions of the soil, and only leaving the harder parts, formed of quartz and archaic rocks, which now stand about in chaotic disorder, and sometimes assume very grotesque shapes and possess considerable height. Since the time when the country produced so much water that it could part with quantities sufficient to erode a valley like the one before us, it seems to have undergone a process of steady and continuous desiccation; for the mean, muddy, and shallow stream which lazily winds its way at the bottom of the valley looks too insignificant to be credited with all the work of destruction of which this region bears indelible marks. During the long distance the river travels without receiving any addition to its volume, it parts with so much water through the process of evaporation that in the dwindled streamlet it is hardly possible to recognise the noble, broad, and clear river of the eastern and mountainous part of the Cape Colony. The hills, whose material was hard enough to resist the force of the rushing water, are permeated by bands of quartz, here called reefs. They lead to the conclusion that gold or other valuable minerals ought to be found in this district, and traces were undoubtedly discovered of such, not, however, in payable quantities.

On leaving the river, we traverse a more or less broken country, and pass a place called Blydeverwacht, remarkable for the possession of a fine open spring which, by missionaries, the former settlers in this place, was led out for irrigation purposes, and then we immediately begin to ascend the plateau of which the precipitous side had been visible for miles ere the Orange River was reached.

The Gaitsab River rises on this plateau and through a deep gap descends to the Orange. In the dry river-bed the road has been laid, and between almost perpendicular walls of limestone, which has become altered in its upper and almost perfectly level layers, we travel till a high elevation has been obtained. We have now entered a perfectly different country. A wide undulating plain extends before us, which is chiefly covered with grass. There is hardly any water, and what there is has been obtained by digging for it, or by damming it up. Only in one place, Heirakhabis, an Englishman has succeeded in turning a rather plentiful supply of it to account, and in producing various kinds of grain by means of irrigation. At most other places, the water-supply serves only for watering cattle, goats, and a very few sheep. For agriculture the supply is insufficient, or could only be obtained at an expense too great to make it profitable.

After about a day's travelling on the plateau, we reach the so-called downs. These are a very remarkable feature of the country, and not at all satisfactorily accounted for yet.

It seems that the soil in certain parts of the plateau shows a tendency to turn to sand. The prevailing winds sweep the country of it and pile it up in long parallel ridges which, almost without exception, run north-west to south-east. In some places they reach an appalling height, and their sides are so steep that an ascent in rectangular direction to the length of the down is simply impossible. These downs, or ridges, follow each other in quick succession and are a curse to the traveller and to his cattle.

Why we should find the downs in one spot and not in another, where there is hardly a change in soil or vegetation, is very curious; yet there is always a varying number of the sand ridges following closely upon one another, and then a stretch of level country again, which allows a rest for man and beast.

A district in which downs prevail is generally perfectly arid. Not a drop of water is met with for miles, and all animal life retires from a region in which even human effort is unable to procure this first necessity of sustaining it. No one voluntarily leaves the beaten track in the "downveld"; the great sameness of aspect is terribly confusing, and only a pure-bred Bushman possesses enough sense of locality to find his way back to camp when once he has wandered among the downs. Yet, strange contrast, these parts, though 'entirely unredeemable from their desert character, offer unlimited first-class pasturage. Though no water could be found, even if searched for at considerable depth, yet the loose sand contains a considerable amount of moisture which gives life to the so-called "Toa grass," than which nothing is better for giving sleek skins to and keeping in capital condition the farmers' cattle.

This fact, easily noticeable by turning over a spadeful of the sand, is probably due to the capillarity of the latter, and is highly appreciated by the farmers, who, when their farms are grazed off (and this frequently happens in dry years), simply drive their cattle into the downs, where they stay until thirst compels them to return to the spring on the farm. It is wonderful how long animals can remain without water. A man who had just crossed the Kalahari from Kuruman to Rietfontein related that his oxen had to travel ten days without water; they pulled in the yoke all the time, yet none died. Horses travel four days without water, but only three when required to work at the same time; sheep and goats when travelling must have water every third day.

Another peculiarity we find in this sand district. It is the so-called "straate" or long stretches of hard ground, almost resembling a threshing-floor, and covered with coarse gravel. These places are



WELL ON THE FARM.

devoid of the least sign of vegetation, and sometimes, as for instance at "Saulstraat," have very considerable dimensions. In the midst of these downs at the "Bakrevier," though no one would suspect that the slight depression in the sand was the bed of a river, the migrating farmers have made a dam which holds water through the greater part of the year. Here I rested my oxen, and with a cart and four horses paid a visit to Upington, which is situated on the Orange River. The district I traversed is very poor, partly very stony, partly deep sand, everywhere very dry. Knowing of the vicinity of the Kalahari desert one has the distinct impression of travelling along its border, and the long ridges of red sand which have to be crossed at intervals appear like feelers or arms of a large octopod, which hugs and saps to death all life-bearing creatures that come within its irresistible grasp. This part of the country, being almost absolutely worthless, offers but scanty subsistence to the herds of "trecking" Boers, *i.e.*, Dutch farmers who, having no ground of their own, lead a nomadic life in what may be practically called the desert. Few have bought large tracks of land from Government, but they require often 10 acres for each head of horned cattle, and even then they are often obliged to move when their water supply gives out. In Upington the river supplies enough water to irrigate portions of the fertile deposits on its banks. Some wheat and many varieties of fruit are grown here and command very good prices. Even this worthless district is gradually being taken up by the farmers, a sure sign that even the Cape Colony is getting crowded and that its agricultural capacities are perhaps being over-estimated.

I returned by another route to Burghersdam and continued my journey northward.

Little remains to be said of the country south of and about Rietfontein. One place only, "Abigwa's Puts," showed a large supply of water; beyond it we were put into the wrong road and experienced the unpleasant novelty of travelling for four days among the waterless downs.

At Rietfontein I gave the cattle another rest, and visited various places on horseback. "Mier" is the last inhabited place towards the east. Beyond it lies the Kalahari in all its terrific attractiveness. "Hogskin Vley" is a "pan" of large dimensions and probably the bottom of a former lake. Of these pans there are a great many in the country, and it is a very strange coincidence that always in their neighbourhood I observed sandspouts, some of which lasted many minutes and ascended to an immense height, carrying straws, or bits of paper, or other light objects up aloft with them. On most of the smaller pans a peculiar reflection of the sunlight in the hard-baked shining clay caused the apparition of open spaces of water. On the larger pans the reflection grew much more intense, and I never saw a finer mirage than when

a large herd of cattle and the herd-boy were distinctly reflected in what appeared a fine blue lake across which they seemed to wander.

Beyond Rietfontein, which is a very poor, unhealthy place, the country improves in many respects. The grass grows much closer together; often its place is taken up by a sort of bush resembling the Karoo bush, and last, not least, though as yet there is often no water to be met with for many days, it might be obtained at intervals of very few miles. The country beyond Rietfontein is a large plateau formed of limestone. Its surface is undulating and, in proportion to its extent, shows comparatively few channels to discharge the water which during the rainy season falls upon it. The country is covered with so-called "vleys," *i.e.*, depressions, in which water collects and remains for some time after the rainy season is passed. At this time of the year, after the rainy season, it is easy to travel through the country, as grass abounds and water is met with at short intervals. Gradually the hot atmosphere absorbs the water in the vleys, and the country relapsing into its arid state becomes very difficult to travel in.

By far the greater portion of the rain-water is absorbed by the porous limestone, in which it is partly kept suspended, partly percolates till it reaches a non-absorbing stratum, along the slope of which it passes on to the nearest outlet. As these outlets are few and far between, owing to the slight inclination of the strata, it is clear that percolation must be a very slow process, and the whole mass of limestone be filled with water like a vast sponge, which requires only very slight pressure to yield rich supplies of the precious fluid. Nature gives us a hint how to tap her rich stores. Many of the vleys mentioned above show a little water in their lowest part, and this the deepest of them retain even in very dry seasons. The natives have long noticed this, and their homes are invariably placed near one of these depressions, where they generally dig a hole which is soon filled with water. This serves for their cattle and themselves; for as a rule they are too lazy to mind that their own water-hole be not invaded by the thirsty beasts. It now seems quite clear that if the deepest of these depressions just reach the water-holding portions of the rock we need only dig a well in any part of the limestone district, and it will, if only about as deep as the vley or rather a little deeper, yield a supply so long as the level of the water kept in a state of suspension within the pores of the limestone does not sink below the depth of the well. Nature teaches us, however, more than this, it indicates to the observant eye the exact spot where the tap ought to be inserted.

The Dutch farmers, who have a marvellous gift of adapting themselves to the mode of life required by the country in which they live, have long found out that water flows more readily in some places than in others, and have tried to recognise by visible signs on the Earth's surface the treasure below it; they have perfectly succeeded in this,

and will show to the uninitiated certain indications which they call "aare" or veins. In some instances these are only disturbances of the strata, in others the healthier growth of vegetation shows the course of the subterraneous stream. In many instances the stranger cannot discover the signs, which the Boer (to whom they are plainly visible) tries his best to point out. There is rarely a mistake in these "aare." A Boer will discover one in a piece of land which is perfectly useless on account of its distance from the nearest spring; he will then hire or buy it from the bastard owner and at once dig a well in his "aar." A failure is the rare exception, and where formerly there was nothing but useless steppe, now numerous human beings find a comfortable existence and their herds of cattle excellent pasture.

On the whole the circumstances described above tend to show that we have before us a district chiefly suitable for the rearing of live stock, and hardly, if at all, fit for agriculture. This conclusion may be generally correct, yet there are exceptions. We do find spots which seem to invite tillage, and there is no doubt that in or near such places the future cities of the colony will rise. I remember one such place in particular, which my companions pronounced to be the finest farm they had ever seen in their lives. Water was plentiful and open, and the soil level, deep, rich, and moist. There are not, however, very many of these places.

The country as described above extends northward to about Rehoboth. It is chiefly covered with very rich greens or Karoo bush, but shows more thorn-trees and other shrubs the further we proceed north. The rivers we cross only in a very few instances show open water, but their beds are well defined and broad, and often water may be obtained in them by digging only a few feet. At Rehoboth there is a hot spring besides several cold ones; they have not been used for irrigation, or rather the attempt has been made and given up again, as it was not attended by very great success. Beyond Rehoboth we reach a mountainous district; hills rise abruptly from the plain, and offer very picturesque views. Water grows more plentiful; forest, or (as it is more aptly termed here) "bush," increases, but shows little useful wood beyond the unavoidable mimosa.

Soon we reach the foot of the so-called Awas Mountain, where water again seems more plentiful and several spots to be fit for cultivation. The mountains rise to a very considerable height, though the pass is only about 6000 feet above the level of the sea. The country now is no longer so uniform as hitherto. We find grassy plains and districts where the mimosa forms a rather dense and disagreeable cover. The latter places apparently possess mostly open water, and would often be fit for agriculture on a very small scale if a market for the produce could be created. In Windhoek, the former stronghold of Jan Jonker Africander, there are a great number of hot springs which, as there is

no arable land which might be irrigated by their means, have very cleverly been turned to account by being led into the various pretty houses, each of which has a bath-room with a running stream of hot water in it. A few people have made the attempt to plough land and cultivate it without irrigation and with only the habitual rainfall to depend on for moisture. It remains to be seen how far they are going to be successful.

Proceeding in a westerly direction from Windhoek, we cross a valley and soon again ascend the very steep side of the Komaab Plateau, the highest portion of which attains an altitude considerably above that of the pass across the Awas Mountain. In winter, snow has been seen here, and even in summer the nights are very chilly. There is little doubt that water will be found in a great many places yet, when this part of the country will be better known, and all farmers who have ever paid a visit to this out-of-the-way region, pronounce it to be first-class pasturage for cattle and sheep.

This plateau slopes in a westerly direction. The highest parts are grassland, only at a lower altitude we find bush again. At a place called Heusis, a few sheep are being kept, and would thrive well if they were properly attended to.

As we proceed westward the aspect of the country grows more uninviting, vegetation decreases, water grows scarce. At a place called Abokheibis, it may be said that we have reached the limits of that part of the country which can be developed by the ordinary means at the command of the simple settlers. The question remains how must they set about it. The history of South Africa answers the question. We notice that civilisation did not settle at various places on the coast and then gradually spread inland. On the contrary, only at one place, the Cape of Good Hope, civilisation landed and proceeded a very considerable distance to the northward. In the course of time it assumed a shape perhaps crude, but at all events perfectly adapted to the peculiarities of the country, and thence spread about till it emerged at the coast where, rather puzzled, it met with its older and more refined European sister, just in the act of very daintily putting her foot on the shore and very perceptibly turning up her nose at the healthy, but rustic and not very well-favoured relative. Yet the transmarine sister brought with her little but second-hand fine airs, the brown country maid supplied the wherewithal to make the sister's stay possible. Had it not been for the wool, the hides, ivory, feathers, etc., which the inhabitants of European origin brought from their homes in the interior to the harbours, these would in all probability even to this day have remained in a comparatively unadvanced state. It was the fact that trade could at once be established in these places which caused Europeans to settle there, and only when trade had sprung up to a considerable extent European enterprise could turn the land round the trade centres to account.

Those cognisant of South African history will recognise the truth of the above assertions which, had we set ourselves the task of writing an historical treatise, might be proved by many facts. The mode of procedure as described above is not the result of accident but of the physical condition of South Africa, and will, if analogies hold good, take place in South Western Africa even more distinctly than in its eastern parts. If here we have coast-lands particularly fit for tropical or sub-tropical products, which require time and capital to develop, we have on the western coast an arid barrier which hardly ever can be turned to account, and we have in both cases to rely on the productiveness of the interior for finding an outlet of its wealth towards the coast. Hence it may be expected that bold pioneers will travel northward from the Cape, settle on the wide, fertile plains and breezy hills of Western Africa, and living for years in a very primitive manner, will produce stock to such an extent, that at last their wealth, useless so long as it cannot be turned over and assume various shapes, will attract the trader and speculator. Then trade will bridge over the arid belt along the coast and regular communication between the interior and the desert coast will ensue.

The resulting trade will be considerable. The stock-growers will increase in number, and for years they will have to limit their wants to those productions which their flocks yield. When the increase of the latter will have given them wealth many long-suppressed wants will crave to be satisfied. Agriculture will always be very limited; groceries will therefore form a staple article of trade, and experience tells us that cotton goods are always in great request in wool-growing countries.

I do not speak of mineral wealth. It is only in countries the geology of which is thoroughly well-known, that the presence of any valuable mineral can with any degree of certainty be surmised. In wild countries the discovery of minerals is always a matter of chance, and should not be introduced into speculations about the probable development of a country. The prospect of an increased trade with the natives in the country under discussion seems to be rather limited. The Namas have few abilities, and their laziness and love of drink will ever be a barrier to a rise of their moral or improvement of their social condition. The fate of the real Nama leaves little doubt; they will, like the American Indian, recede before European culture, which would either force them into competition or subjection. For the former they lack the intellectual, for the latter the physical stamina. They will lead a precarious existence as herd-boys and thieves, till they have become civilised into the Kalahari or out of existence altogether. A better fate seems to be reserved for the so-called Bastards, whose good qualities may be brought out in the contact with Europeans, and it is very likely that from among their younger individuals we shall, in a not very distant future, recruit our upper or confidential servants, while the older men, being farmers and owners of large tracts of country and numerous

herds, will become the consumers of a part of the imported products of our home industries. With the Bantu inhabitants of the country the case is different; but as they belong to the districts further north they can have no place in the present discussion.

Very little remains to be said about the arid country west of Abokheibis. The want of water is severely felt, still more so the want of rain. Sometimes vegetation seems to make a sudden start, and then people like sending their cattle into this district, because it is free from diseases; and while the cattle feed here the grass on the farms (which is often grazed down to the ground) gets time to grow again. Cows in these parts, when milked, grow very thin. Neither can oxen live here and be worked; they do not find sustenance enough to keep in condition. Only young cattle—of whom no work of any kind is required, find enough food to present a sleek appearance.

One exception to this rule is the bed of the Swakob River. Though it is perfectly dry, it yet holds enough moisture to allow not alone a rich vegetation, but, in some parts, even a little agriculture. This river-bed may be considered the high road into the country, and there is no doubt that along it a few more settlements might be created. Of a continuance of this moisture in its bed there is no failure to be expected. It is yearly supplied by the rains which fall in the higher parts of the country, and which cause even the dry Swakob sometimes to carry seaward water which the soil found no time to absorb. Very few instances have, however, been known in which these floods reached the ocean. As a rule they are swallowed up by the ever-thirsty sand in the river-bed, so that even if at Otyimbingwe the river happens to be a roaring torrent, at Cannicontis it will be almost dry, only water will ooze into a hole of very slight depth instead of having to be dug for several feet. Thus we have good vegetation along the river-bed all the year round.

The country I have travelled over may be divided into four parts, by a line going about parallel with the coast from the Swakob River to the Orange, and through the place called Abokheibis, and by the degree of latitude of Rietfontein. None of the four parts is particularly fit for agriculture. The two southern ones offer good pasture-lands, but suffer from want of water, which does not seem to be procurable everywhere. The left half of the northern part is an absolutely worthless desert, and the right half contains some of the finest pasture lands I have seen in any part of the world; they offer the further advantage that with little trouble water might be procured almost anywhere. One thing all these parts have, however, in common, and that is, a bracing, salubrious, and lovely climate.

HISTORICAL EVIDENCE AS TO THE ZIMBABWE RUINS.

By Dr. H. SCHLICHTER.

MR. BENT, speaking some few months ago before the Royal Geographical Society about the Ruins of Mashonaland, came to the conclusion that he could throw back these strange buildings to a pre-Mohammedan period, but that then came the difficulty.

The thought has since occurred to me that it would be interesting to investigate how far the various geographical reports which have come down to us from antiquity would contribute to the solution of the highly important question, namely, at what period these buildings were erected, inhabited, and finally deserted by a race which was foreign to Africa, and had reached these countries—far to the south of the Equator—at a time when no other communication whatever existed with the entirely unknown coasts of South Africa.

Mr. Bent expressed his opinion that these buildings are of Arabian origin, a view which my investigations fully confirm. In the first place we have to consider what connections existed in antiquity between Arabia and the East Coast of Africa.

What the Phœnicians were on the Mediterranean and the eastern shores of the Atlantic, the ancient Arabians were on many parts of the Indian Ocean. But the extent of their trade and the geographical explorations connected therewith, although of the utmost importance, are but incompletely known even up to the present day. Fortunately, however, the most reliable of the still extant writings of antiquity contain valuable information concerning the early enterprises of the Arabs. They show that the inhabitants of the south-western parts of the Arabian peninsula were the first to open up the southern hemisphere of our globe, penetrating, as they did, into the entirely unknown southern parts of the Indian Ocean.

South-Western Arabia was the centre of the maritime commerce carried on with the countries adjoining the shores of the Indian Ocean and Muza; Athana, Cane, and other coast places were the principal emporia for this trade. The 'Periplus of the Erythræan Sea,' well known as one of the most reliable books upon the commerce and navigation of the ancients in the Indian Ocean, testifies to the great importance of this commerce in the *early* times of antiquity, by stating* that in by-gone days when the merchants from India did not proceed to Egypt, and those from Egypt did not venture to the remote regions beyond Arabia, Arabia Felix, and especially the emporium situated on the site of the present town of Aden, was the centre of the whole

* 'Periplus,' Chapter 26; compare also Duncker, 'History of Antiquity,' vol. i., 1877, p. 322.

commerce in the same way as Alexandria was the commercial centre of Europe and Asia at the time when the 'Periplus' was written, namely, in the first century of the Christian era.

Moreover we learn from the 'Periplus' * that the coast of Eastern Equatorial Africa, corresponding to the Zanzibar coast of to-day, was a dependency of South-Western Arabia.

The author of the 'Periplus' says: "The whole territory of Azania and Rhapta is governed by the despot of Mopharitis, because the sovereignty over it, by some right of old standing, is vested in the kingdom of what is called Arabia Prima. The merchants of Muza farm its revenues from the king, and employ in trading with it a great many ships of heavy burden, on board of which they have Arabian commanders and factors who are intimately acquainted with the natives, and have contracted marriage with them, and know their language and the navigation of the coast."

We know that the region of Mopharitis or Mapharitis (the modern Ma'afir) is a district between Aden and the Straits, and Schwanbeck,† Kremer and Fabricius ‡ have shown that by the "tyrant of Mopharitis," mentioned in this passage of the 'Periplus,' we have to understand a vassal chief, or sheik, who was himself a dependent of the reigning Tobba of the Himyaritic family which reigned in south-western Arabia. The whole of the coast of Eastern Equatorial Africa was, therefore, under Arabian rule at the time when the 'Periplus' was written, namely, in the second half of the first century of our era.

The chief commercial centre for the intercourse with East Africa was, as the passage quoted states, Muza, the great emporium within the Straits of Bab-el-Mandeb, and this as well as the other descriptions of the 'Periplus' show that the trade with Africa was of the highest importance for the inhabitants of south-western Arabia.

But Arabian influence in East Africa was not merely of a temporary nature, but an old and permanent institution, as is plainly stated in the above cited passage, from which we learn that the sovereignty over Eastern Equatorial Africa was, by some right of old standing, vested in the kingdom of Arabia Prima. Sprenger § and Fabricius || correctly remark that this can only refer to the old Sabæan-Gebanitic period, as the more recent Himyaritic dynasty was much too short a time in power to admit of its being referred to in this way.¶ Dillmann ** has proved that the

* Chapter 16.

† 'Rhein. Museum für Philologie,' Jahrgang 7, p. 335.

‡ 'Der Periplus des erythräischen Meeres, mit kritischen und erklärenden Anmerkungen,' 1883, pp. 135 *sqq.*

§ 'Das alte Arabien,' pp. 255 *sqq.*

|| 'Periplus,' pp. 135-136.

¶ Compare also Caussin de Perceval, 'Essai sur l'histoire des Arabes,' tome i., 1847, pp. 47-61, 62 *sqq.*

** 'Monatsberichte der Berliner Akademie der Wiss.,' 1879, p. 425.

somewhat peculiar expression of Arabia Prima is perfectly correct, and that it refers to Muza as distinguished from Aden, which was in earlier times the exclusive emporium for ships coming from and going to East Africa and India, and was for this reason, down to Ptolemy's time, simply called *Arabia emporium*.

All other ancient geographers, who had some detailed knowledge of South Arabia and the regions beyond, fully confirm these statements of the 'Periplus.'

Agatharchides,* Strabo,† and Ptolemy‡ testify to the maritime commerce of the inhabitants of Southern Arabia.

Eratosthenes,§ the greatest geographer in the earlier days of Alexandria, speaking about the navigation on the coasts of Arabia and East Africa beyond the Straits of Bab-el-Mandeb, states that the navigation extends along the myrrh country, in the direction of south and east, as far as the cinnamon country, a distance of about 5000 stadia.

Artemidorus|| says the Sabæans either cultivate the ground or follow the trade of dealing in aromatics, both the indigenous sorts and those brought from *Ethiopia*. He further remarks about them that they have become very rich by their commercial enterprises, and possess great quantities of gold and silver, so that even the doors, walls, and roofs of their houses are variegated with inlaid ivory, gold, silver, and precious stones.¶ I have shown on a previous occasion ** that Ptolemy has left us a very good description of the east coast of Africa as far south as Zanzibar and Ras Mamba Mku, and he himself states in the first book of his Geography that he obtained the most valuable part of this information from merchants coming from Arabia Felix. They gave him a most accurate description of the emporia, distances, and directions along this coast, on which they had numerous settlements and trading stations.

But not only was the coast in the hands of the Arabs, but we have good reason to believe that their trade connections and influence extended also over a considerable part of the interior of East Africa.

Thus we see that all the best authorities of antiquity agree that Eastern Equatorial Africa was under the influence of South-Western Arabia; that this influence was, in the first place, due to trade connections, but that according to our best and most reliable source of information, viz., the 'Periplus of the Erythræan Sea,' Eastern Equatorial Africa was for a long time politically dependent on Mopharitis and Yemen.

* 'De Mari Erythraeo'; C. Müller's edition, 'Geographi Graeci Minores,' vol. i., 1855; compare also Bunbury, 'History of Ancient Geography,' 1879, vol. ii, p. 59; and Glaser, 'Geschichte und Geographie Arabiens,' pp. 10-11.

† Book XVI., Chapter 4, § 23.

‡ Book I., Chapter 17.

§ Strabo, XVI., Chapter 4, § 4.

|| Strabo, XVI., Chapter 4, § 19.

¶ Compare also Agatharchides, *loco citato*.

** *Proceedings*, R.G.S., September, 1891.

No other nation or country is mentioned in the classical writings of antiquity that had permanent political or commercial connections with the east coast of Africa. Many Greek merchants, it is true, in the later times of the Ptolemæan dynasty, and under the Roman empire, visited India and East Africa; but we learn from Ptolemy's Geography, as well as from the 'Periplus,' that such journeys were only commercial enterprises of a purely private character, without any ethnographical or political importance whatever. Eastern Equatorial Africa was, during the Greek and Roman periods of antiquity, under the sovereignty of South-Western Arabia.

Reverting to the ancient buildings of Mashonaland, we are compelled to come to the conclusion that the only nation which might come into consideration during the Greek and Roman times of antiquity, is that which held exclusively the trade with Eastern Equatorial Africa—viz., those Arabians who inhabited the South-western parts of the Peninsula. But nowhere can we discover the slightest trace or hint referring to any colony or emporium to the south of the Zanzibar coast. Ptolemy's furthest point to the south is Cape Prasum, the position of which is doubtful, and we know that he erroneously believed that from this point the coast of Africa turned to the east, and that a hypothetical continent connected Africa with the country of Cattigara, in Eastern Asia, thus regarding the Indian Ocean as an inland sea, analogous to the Mediterranean, but of much larger extent.

The author of the 'Periplus' is more correct in this respect in saying that the emporia of the Rhapta territory are the last on this coast, and that beyond these parts an ocean hitherto unexplored curves towards sunset, and, stretching along the southern extremities of Ethiopia, Libya, and Africa, meets the western sea.*

I have, in a previous publication, pointed out the high importance of this passage as compared with the statements by Ptolemy and other ancient writers. But Glaser,† the well-known Arabian traveller, goes too far in regarding this passage, in his recently published work, as a direct reference to the districts near the Cape. On the contrary, the statement that this southern ocean was regarded as entirely unexplored proves that no Arabian colonies existed to the south of Rhapta at the time when the 'Periplus' was written, because it is utterly impossible that at this age the Arabs could have kept their knowledge of these places secret from their numerous Greek friends and competitors.

The entire absence of any information referring thereto further proves that such extensive colonies as those of Mashonaland could not have been built or inhabited within a century from the time when the 'Periplus' was written; and we are, therefore, obliged to draw the

* 'Periplus,' § 18.

† 'Geschichte und Geographie Arabiens,' vol. ii., p. 206.

conclusion that no connection whatever *can* have existed between Arabia and South-eastern Africa during the period extending from the end of the first century before, to the middle of the second century after the commencement of our Christian era. Therefore it is absolutely impossible that the ruins of Mashonaland could have been built, inhabited and deserted within this period of time.

Ptolemy, the last of the ancient authorities quoted, wrote about the middle of the second century of our era. In the year 634 A.D. South-western Arabia was absorbed by the Mohammedan conquest, and we have, therefore, now to consider the possibility whether the ruins were erected during the time from 150 to 634 A.D. It is easy to show that this was not the case. According to Bent and Maund the ruins represent a great gold-producing centre, and there can be no doubt that the foreign invaders who erected and held them exported enormous quantities of the precious metal. Mr. Maund, who has studied the subject, says that it is astonishing to see the amount of work done by the ancients; millions of tons of soil must have been overturned, and thousands of slaves employed; for he is of opinion that it can have been nothing else than slave labour, as is evident from the crushing-stones.

But there is no indication whatever that any considerable amount of gold was imported into Southern Arabia during this time. On the contrary, the rapid decline of the Himyaritic kingdom soon after the second century of our era is well known.* A natural phenomenon, the destruction of the great dyke near the Sabæan capital of Mareb by mountain torrents,† caused great changes in the south-western part of the Arabian peninsula. It probably took place at the beginning of the third century; and this misfortune, which by Oriental writers is spoken of under the name of Seil-al-Arim, was of disastrous consequences for Yemen. The country round the capital, formerly fertile and prosperous, now fell rapidly into decay, many influential families left the country, and the power of the kings waned more and more. The Jews, who, after the destruction of Jerusalem, immigrated in great numbers, gained considerable power; and Dsu-Nowas, who became king towards the end of the fifth century, adopted their religion, and persecuted all those who professed another creed.

Aryanism had at an early date been introduced into Southern Arabia, and was accepted in many parts of the country, *e.g.*, by the tribes of the Himyar, Ghassan, Rebia, and the inhabitants of Nejran. The latter, especially, greatly suffered from the cruelty of Dsu Nowas, and it is well known that the persecution of the Christians was the reason for the great Abyssinian invasion of Yemen in the year 529, by which the Himyaritic kingdom was overthrown. Its re-establishment in the year

* Compare Glaser, *eodem loco*, vol. ii., pp. 240-241.

† 'Historia Jemanae,' edidit Johannsen, 1828, p. 233.

602, with the assistance of a Persian army under Wehraz, was only of very short duration, for in 634, according to Palgrave, South-western Arabia was finally conquered by the Mahometans.

It is evident that during this period of incessant internal feuds and religious quarrels no colonies like those to which the ruins of Mashonaland belonged could have been formed; and the introduction of Judaism and Christianity into Yemen at a very early date is strong proof that these ruins—which were unmistakably built by the Arabians when they were devoted to phallic worship—cannot possibly belong to this period of the history of Arabia.

I think I have herewith conclusively proved that the ruins in question neither belong to the time in which the Himyaritic dynasty flourished, viz. from the first century *before*, to the second *after* the beginning of our era, nor to the subsequent time in which the Himyaritic kingdom under the influence of Judaism, Christianity and Mohammedanism, declined and finally perished.

Mr. Bent threw these ruins back to a pre-Mohammedan period, but I think I have shown that we are fully justified in throwing them back to a much earlier date, viz. for more than 600 years, that is to say, to the time before the commencement of our Christian era. Therefore, these most important remnants of a bygone age—which Carl Ritter,* more than seventy years ago, regarded as most important for the comparison between the ancient and modern geography of Africa—point to a still earlier date, and must have been erected before our Christian era. Probably they belong to very much earlier times, but prior to Strabo's time classical information about Southern Arabia and Eastern Equatorial Africa is so fragmentary and unconnected, that accurate conclusions about the extent of Arabian influence in East Africa are impossible.

We must, therefore, rest satisfied for the present with having proved that these ruins, and the Arabian colonisation in South-East Africa connected therewith, are prior to the above stated period.

I should like, however, to mention a number of facts which may, in connection with future investigations, throw more light upon the origin of these buildings. Firstly, the large circular building of the Great Zimbabwe ruins, as described by Mr. Bent, is built of small blocks of granite broken with the hammer into a uniform size, but bearing no trace of chisel-marks, and no mortar had been used in the construction (*Proceedings*, R.G.S., 1892, p. 277).

The same kind of construction, viz. hewn stones neatly put together without mortar, was found by Halévy † in the ancient and great ruins of the city of Me'in in South Arabia, only that in this case the stones are larger. Halévy found the ruins of Me'in to be in all probability the

* 'Erdkunde,' Africa, 1822, p. 144.

† 'Journal Asiatique,' 6^e série, t. 19, 1872, pp. 32, 75, 85, 508.

ancient capital of the Minaei, the "gens magna" of Arabia, a tribe about the position of which, in the modern map of Arabia, geographers for a long time greatly differed.

Not far from this place, at Berahhish, in the lower Jaouf district, he discovered the ruins of an ancient temple which, according to an inscription it bears, was dedicated to "Attar, and to the gods of Me'in and Ital, to all the gods of countries and nations, to all the gods of the sea and the land, and of the orient and occident, and to the kings of Me'in." This is an ancient ruin, and surely the people who dedicated a temple to all the gods of the sea and land, and to the gods of the different countries and nations, must have had some intercourse by sea and land with foreign countries. That not only the gods, but also the kings of the Minaei are mentioned, may perhaps be a clue that this tribe, well-known to the classical writers, was one which, at an early date of antiquity, had partly exchanged already the nomadic and agricultural pursuits of their kinsmen, for the more dangerous but profitable calling of the merchant and navigator.

The second point is, these ruins of Mashonaland were doubtless in connection with the gold production carried on in the surrounding country, and enormous quantities of gold must have been exported from South Eastern Africa to Arabia at the time when this gold production flourished. Now, I have carefully looked through the statements of the classical writers, but I am unable to discover that gold formed an important trade article of South Arabia during the classical period of antiquity. Of course, different authors mention that gold was found at various places of the Arabian peninsula; but this gold is of subordinate importance. Herodotus* states that the Arabians paid a tribute of 1000 talents of frankincense to Darius. Pliny† says that the Sabæans are very rich, because the Arabs always sell but never buy anything, and according to Strabo‡ this was one of the principal reasons which influenced the avaricious Emperor Augustus to undertake the expedition of Aelius Gallus against the southern Arabs. But nowhere is the slightest hint to be found that gold was a trading article of the southern Arabs during the classical period. Quite different, however, are the much more ancient reports of Palestine and Egypt. Mr. Bent is correct in saying that the Bible is full of allusions to this fact. Sabæan gold is mentioned, *e.g.*, by Ezekiel as one of the chief articles of trade between South Arabia and the Phœnicians. Moreover, the Arabians paid tribute in golden ingots and rings to the Kings of Assyria and Egypt. The celebrated inscriptions on the temple of Deir-el-Bahari§ clearly point

* Book III., Chapter 97.

† 'Hist. Nat.,' Book VI., Chapter 32.

‡ Book XVI., Chapter 4, § 22.

§ See Mariette, 'Deir-el-Bahari, Documents topographiques, historiques et ethnographiques,' 1877; and Dümichen, 'Die Flotte einer ägyptischen Königin,' 1868.

to East and South Africa, as many of the animals depicted, *e.g.*, giraffes, leopards, baboons, and also some of the natives are clearly of African origin, and one of the chief articles which the Egyptian ships brought from the country of Punt was a great quantity of fresh gold from the country of the Amu.

It is a remarkable fact that even as late as at the time of Herodotus East Africa was known as a gold-producing country. The father of history states * that at the furthest limits of Africa there is a country where gold is obtained in great plenty, huge elephants abound, and there are wild trees of all sorts, including ebony.

Later on, at the time of the 'Periplus,' gold was entirely unknown as a product of East Africa.

Thirdly, it is evident that some of the Mashonaland ruins were used for religious purposes. Now, we know from the very careful investigations of Lenormant † and others, that solar and astral worship was the foundation of the old religion of the inhabitants of Yemen, but that they also worshipped stones analogous to those which we find in the Phœnician temples of Tyre, Byblos, Paphos, Malta, Gozo, ‡ and many other places, and which represented *Baal* and *Ashera*.

And this is exactly what we find at Zimbabwe. That the sun formed the principal part of the worship of the old colonists is proved by Bent's discoveries, and the stone similar to the Phœnician cone is the now celebrated conical tower of Zimbabwe, which is not less than 32 feet high. Lenormant adds that each place of worship was dedicated to a particular god, but other gods were likewise worshipped at the same place. Within the sacred precincts, oxen, sheep, or camels were slaughtered, often in great numbers. Besides, land, cattle and slaves belonged to these places of worship, which were donations from rich and devout people.

We know that at Zimbabwe various other buildings were within the precincts of the temple, which were probably occupied by the officials, the slaves, and the cattle. This fact reminded me of a report of Herodotus, § of which, as far as I know, no satisfactory explanation has yet been given, *viz.*, the so-called table of the sun. This is described as a meadow within the skirts of a city in Ethiopia where *boiled* flesh was provided by the magistrates of the place, and everybody could eat as much as he liked during daytime. ||

Wilkinson ¶ remarks that the custom of boiling flesh seems to have

* Book III., Chapter 114; compare also Rawlinson's edition of 'Herodotus,' vol. ii., p. 417, note 5.

† 'Histoire ancienne de l'Orient,' 9^e édit. vol. 6, 1888, pp. 392 *seqq.*

‡ Compare Perrot & Chipiez, 'History of Art in Phœnicia,' vol. i., 1885, pp. 61, 275, 276, 281, 311, 312.

§ Book III., Chapters 17 and 18.

|| Compare also Pomponius Mela, 'De chorographiâ libri tres,' Book III., Chapter 9.

¶ Rawlinson's edition of 'Herodotus,' vol. ii., pp. 417-418, note 6.

been very ancient with the Arabs, whilst the Egyptians more frequently roasted it, and boiled their fish. The whole report, compared with the above described religious customs of the Arabs, seems to point in the direction of the ancient Arabian sun-worship, which was doubtless practised at Zimbabwe and the other Arabian colonies of Mashonaland. This is, of course, merely a suggestion to which I attach no importance; but I thought it would not be out of place to mention it in connection with the above stated facts referring to the ancient Arabian solar worship.

All that I wanted to show respecting these ruins is the fact which I consider conclusively proved, that they are not only of pre-Mohammedan origin, but that they could not possibly have been erected during the six hundred years preceding the Mohammedan era. Furthermore, all that I have ascertained confirms Mr. Bent's statement that they are of Arabian origin. I have pointed out in the course of this paper that Eastern Equatorial Africa was, during the classical period of antiquity, a dependency of South-Western Arabia. For a very long time it was almost entirely unknown to Greek and Roman geographers. Even Strabo's information was very limited, and did not extend further than the regions near Cape Guardafui. The reason was that the Arabs had monopolised the maritime trade with the countries beyond the Straits of Bab-el-Mandeb. But suddenly a change took place. Was it the growing commercial importance of Alexandria, which would no longer allow Greek and Roman merchants to be excluded from the Indian Ocean? Was it the decline of the ancient kingdom of South-Western Arabia which was unable to protect the monopoly of olden times? We are unable to answer these questions at the present time.

But I have shown that we know for certain that in the first and second centuries of our era the Arabs willingly communicated to the Greek merchants and to the scientists of Alexandria their extensive knowledge of the unknown countries to the south, and that, therefore, the ancient African discoveries of the Arabs were not entirely lost to science, but form one of the most interesting and important parts of the historical geography of Africa.

In conclusion I may be permitted to add that some further mathematical and historical evidence about the ruins of Zimbabwe has been published by me in *Petermann's Geographische Mittheilungen*, 1892, Heft. 12.

THE PLATEAU OF LORRAINE.*

THE true scope and aims of geography as a science are still so far from generally understood, in this country at least, that the little work which

* 'Le Plateau Lorrain. Essai de Géographie régionale.' By B. Auerbach, Professor of Geography at Nancy. Berger-Levrault & Co.: Paris and Nancy, 1893.

has lately appeared under the above title deserves special notice, as one in which a consistent attempt has been made to bring to bear on a limited area such a method of investigation as shall throw light on the harmonious interaction of the causes to which the varying relations between man and nature are due. In his preface the author shows for what reasons so much of existing regional geography falls short of this object. *Artificial* (e.g. administrative) divisions of a country have been made the basis of the various treatises, whereby the harmony which reigns in districts which possess a *natural* unity has been lost sight of. A definition of such natural regions is thus necessary at the outset. M. Auerbach points out that the term *pays* has already acquired a technical signification among geologists, as applied to such sections of a geological formation, as by their particular characteristics possess an individuality of their own; and the immense influence exercised on human life by such peculiarities of soil and structure makes the essential element the same for the geographical unit also. Here, however, other considerations arising from climate, and to some extent from political or historical factors, have to be taken into account in addition.

The Plateau of Lorraine lends itself particularly well to a division into such natural regions, which agree well on the whole with long recognised districts (Le Barrois, La Woëvre, etc.), the names of which are thus applicable. The country forms the eastern edge of the "Paris basin," and the various beds of the Jurassic and Trias formations succeed one another with remarkable regularity, sloping gradually upwards from the west, but falling to the east in steep escarpments. The alternations of limestones, forming elevated bands, with clays and marls, which appear rather as gently sloping plains, results in a succession from west to east of natural regions corresponding with the various formations, while minor variations in the same zone, caused by faulting, etc., enable us to trace distinctions as we proceed from north to south. There can be no doubt that these regions, laid down by the author, do possess a distinct individuality, and although similar conditions tend to some extent to be repeated (e.g. the limestone plateaux have naturally a certain family resemblance), yet local causes have special effects on the life of the inhabitants, and the laws which govern this may be best elucidated by studying each region in turn in its entirety. Among the points to which special attention is directed we may mention the grouping of the inhabitants according to the presence of water, and the agricultural or other capabilities of the soil; the effects of geological structure on the courses of the rivers, and the resulting facilities for communication; the effects of the situation of the province in the debatable ground between France and the Empire; and lastly the movement of population and its causes.

A few of the most striking features of the various districts may be given by way of example. The *Barrois* is a plateau of Portlandian

limestone, forming the western frontier of Lorraine. The aridity of the upper regions, caused by the porous nature of the soil, makes the population tend to congregate in the river valleys, which are also highways of communication between the Seine and Meuse. The liability to invasion, either from east or west, led some however to retreat to the plateaux, where also the quarries, the deposits of iron, and the forests, led to the formation of villages. The valley of the Meuse, which is shut in in part by cliffs of Corallian limestone is especially liable to floods. The deposits left by these fertilise the meadowlands, and much fodder is grown and exported; the crops, however, often suffer immense damage. The valley has become an important line of communication between the coal-fields of Belgium and the iron-works of the Moselle, by which local industries too have been stimulated. The forests of the *Cotés de Meuse* (Corallian), bordering that river on the west, have given considerable employment in wood-work; population, however, is attracted more to the plain of *La Woëvre* to the east (Oxfordian), whose clayey soil is devoted to the cultivation of cereals. On the plateau of *Briey* (Bathonian) the presence of iron ore brought early prosperity to the district, the abundance of wood favouring the rise of smelting furnaces. The zone of the *lias*, with its fertile and easily worked soil, may be called the granary of the province, of which it is also the centre. Population was early attracted, and here in time was formed the nucleus of the Lorraine dominion. The Moselle has exercised an important influence on the prosperity of this zone. Its old connection with the Meuse by the strait west of *Toul*, and the slight barrier between its basin and that of the *Saône*, have rendered possible a system of communication by canals, connecting the North Sea with the Mediterranean, and the Atlantic with the Rhine and Danube. Near the crossing of the two main lines is situated *Nancy*, in the centre of an important iron district, which supplies much of the traffic. In the zone of the *Trias*, further east, important deposits of salt and gypsum gave rise to an industry at a very early date.

Through all these various regions, one fact is uniformly observed, viz., the steady decline of population, even in the most favoured parts. The industrial centres, it is true, gain at the expense of the rural districts, but even this gain is not always maintained. Statistics show generally an excess of deaths over births. *M. Auerbach* gives much attention to a search for the causes. Affluence as well as want, he says, seems to contribute to the result, there being often among the well-to-do a disinclination to increase the number of those among whom the land is to be sub-divided, and celibacy is much in favour. The race, however, is uniformly described as robust, though some industries are harmful, and in parts give rise, it seems, to drunkenness. Yet statistics show that in some agricultural parts infirmities are more prevalent than in neighbouring industrial districts, from which the conclusion

is drawn that heredity exercises a more important influence than environment.

The question of the individuality of Lorraine as a whole is not entered into very fully by the author, who sums up very briefly the results of his investigations as affecting the province generally. He holds that it does certainly form a distinct geographical entity, but except the regularity of its structure and the even level maintained by the crests of the ridges, he does not show what broad characteristics distinguish it from other parts of the Paris basin. The Jurassic beds all pass out of the limits of the province, and the natural boundaries suggested are not very decided in parts. Towards Germany, the Vosges, the Permian and carboniferous *massifs* of the Saar, and the Ardennes, are held to be unmistakable natural limits, while on the side of France the transition is said to be imperceptible. Yet elsewhere the importance of the Moselle in forming a tie with the regions to the north-east is pointed out, and the long hostility of Lorraine to France is ascribed to geographical causes. The small influence of the German race on its inhabitants is, however, pointed out in several places.

There is, perhaps, some risk in this method of inquiry, lest the mutual relations of the various units of which a country is composed should be lost sight of. The work, however, only professes to be a chapter in general geography. The author has brought to his researches that philosophic spirit which can alone lead to a profitable result, and a large measure of success has been attained in the attempt to explain the phenomena observed. He has had recourse to the most complete sources of information on the various subjects dealt with, and copious references to authorities are added to the text. The book is well illustrated by reproductions of photographs and by numerous sketch-maps.

THE PEVTSOF EXPEDITION AND M. BOGDANOVITCH'S SURVEYS.*

By E. DELMAR MORGAN.

WHEN the late General Prejevalsky died at Karakol, at the east end of Lake Issyk-Kul, as he was on the point of setting out on another expedition to explore Northern Tibet, the Russian War Minister and the Russian Geographical Society selected as his successor Colonel Pevtsof, an officer well known for his excellent geodetic surveys in Jungaria, Mongolia, and along the Chinese frontier, as well as for his treatise on a new method of finding the latitude by the corresponding altitudes of two stars, which he kindly explained to the writer at Omsk in 1880. The staff of his expedition was composed of the two officers, Captain Robarofsky and Lieutenant Kozlof, who had accompanied Prejevalsky's former expeditions, and of the mining engineer, K. I. Bogdanovitch, known for his geological investigations in Trans-Caspia and

* Map, p. 96.

North-Eastern Persia. Besides these officers, twelve Cossacks, an interpreter, an assistant for dressing skins of birds and animals, and native guides formed the *personnel* of the expedition.

To summarise as briefly as possible the results obtained by the expedition and its leader before noticing the special part taken in it by Bogdanovitch, I cannot do better than quote General Stebnitsky's report to the Russian Geographical Society.* He says: Thus for the first time an itinerary has been laid down and explored from the bisection of the caravan routes near Ush-Turfan in a south-easterly direction to the River Yarkand-daria; along this river for about 270 miles to the city of Yarkand; the position of this river and of objects along its banks having thus been for the first time ascertained by Pevtsof and his companions. From Yarkand the expedition joined the highroad leading past Khotan and Keriya to Niya, surveyed by former explorers, and plotted on the map according to the observations of English travellers. From the oasis of Niya the travels and surveys of Pevtsof and his companions, to the north (as far as Mazar Jafar Sadyk), to the east and south, to the elevated plateau of Tibet, contribute many new geographical and cartographical data. To the south-east of Cherchen, the expedition went as far as Unfreezing Lake (Aiag-kum-kul), and thus linked its survey with that of the late General Prejevalsky. The most important geographical observations made in the course of the expedition were those undertaken in the great area containing Lakes Achik-kul and Aiag-kul, situated between the Kuen-Luen, the ranges of Astyn-tagh, Tokuz-dawan, and Akka-tagh. Quite a new light has been thrown on this borderland of Tibet by Pevtsof's surveys.

Farther north the route taken by the expedition along the Cherchen-daria, closing upon and bisecting the itineraries of Prejevalsky from Lob-nor, and along the Konchek (or Kurla)-daria, goes as far as Kurla (Kuropatkin's farthest in 1876-7). Eastward of Kurla, Pevtsof's expedition carried their survey round the whole of Lake Baghrash-kul, the western end of this lake having been reached by A. Wilkins, Kuropatkin's companion, in 1877; he was, however, only able to establish the fact of the existence of such a lake; it has now been accurately surveyed for the first time. Furthermore, Pevtsof's survey from Manas to the Russian frontier supplies new facts for the cartography of the region traversed.

Combining all the geographical work done by the several members of the expedition, we obtain the following: A route survey, 6300 miles in length, 4000 of which were taken by Pevtsof's own hand with plane-table, on a scale of 5 versts to the inch, the heights of distant mountains having been measured. The latitude and longitude of 34 points have been determined astronomically, and of these 18 were fixed by Pevtsof himself, besides six longitudes by lunar occultations of stars. All Pevtsof's positions, being those of an experienced geodetist, have considerable weight as regards accuracy; thus the probable error in the determination of time by a pair of stars (at equal altitudes) is only $\pm 0.1''$, and the probable error in latitude $\pm 0.7''$. No less than three hundred and fifty heights were determined barometrically, and one hundred of these by Pevtsof himself with mercurial barometer.

Near Lake Dashi-kul, in order to ascertain by triangulation the height of Mount Ak-tagh (in the Kuen Luen), Pevtsof measured a base, 2 miles in length, from which he took angles to the summit of the mountain. By means of this base he made some interesting observations on the velocity with which sound travels in these regions at an elevation of 14,000 feet above the sea, the mean of twelve good observations resulting in a velocity of sound = 1068 feet per second, or 325.5

* Otchét (Report) for 1891.

mètres, and this, after applying corrections for temperature, gave a deduced velocity of 330·7 mètres per second.

The highest points reached by the expedition were 18,000 feet (Robarofsky) and 19,000 feet (Bogdanovitch), and near Toksun they discovered the hollow of Assa, 160 feet below sea-level, the same hollow having been observed at its eastern end by the Brothers Grum-Grijimailo.

Magnetic observations were carried out by Pevtsuf at ten points, and at two of these all the co-ordinates—variation, dip, and magnetic intensity—were determined. Collections in zoology, entomology, and geology were made, and ethnographical particulars relating to the inhabitants of those regions, collected.

Thus far General Stebnitsky, we now proceed to the account given by Bogdanovitch* of his explorations. The geography of the regions he was about to visit had been outlined by former travellers. Following the chronological order, these were from the Indian side—Mir-Izzet-Ullah in 1812; Thompson in 1848; Hermann Schlagintweit in 1854–8; Pundit Muhammed Hamid in 1864; Johnson in 1865; Robert Shaw in 1868–9; Hayward in the same years; Henderson in 1870; Forsyth and the officers of his expedition in 1873; Pundit Nain Singh in 1865–6 and 1873–5; Carey and Dalgleish in 1885; Ney Elias in 1887; Younghusband and many others in 1887–90. From the Russian side—Trushnikof in 1713; Yefrémoſ in 1780; Valikhanof in 1858; Kaulbars in 1872; Kuropatkin in 1876; Prejevalsky in 1878 and 1885; Grum Grijimailo in 1886; Grombchevsky in 1885, 1887, and 1890.

While the general result of all their explorations was to acquaint us in broad outlines with some of the principal features of the physical geography, there yet remained much detail to fill in, and the state of our knowledge showed the want of systematic treatment.

There was, moreover, one great *desideratum* felt. Of all the above-mentioned travellers only three† were geologists, and not one of these returned to tell his tale. Adolph Schlagintweit was killed at Kashgar in 1857, and Stoliczka died on the Karakoram on his way back from Kashgar in 1874. To supply this want was, therefore, the aim and ambition of Bogdanovitch, whose earlier studies of the works of Humboldt and Von Richthofen and of his eminent countryman, Mushkétov, had roused in him an enthusiasm for the task, and a desire to continue investigations they had so successfully initiated.

If there were no more brilliant discoveries to make in descriptive geography, such as those associated with the names of the travellers and writers enumerated above, a closer study of the geology of the region on the spot might lead to generalisations and conclusions tending to the furtherance of knowledge. "The fertile syrts of the Tian Shan, the gigantic heights buttressing the Pamirs on the east, the stifling plains of Kashgaria and their oases, the sandy deserts with their buried cities, the wild and desolate mountain-chains of the Kuen Luen, and lastly the death-like solitudes of Northern Tibet," these, in the words of our author, were to be the scenes through which the expedition was to take its way.

M. Bogdanovitch, like many another traveller whose experience of mountaineering has been gained in the Alps of Europe, where fertile valleys and lowlands lend so pleasing a contrast to the background of rugged cliffs and snowy peaks, was much impressed with the grandeur of the scenery in Central Asia, where snowy chains

* *Trudii Tibetaskoi ekspeditsii*, part ii. St. Petersburg, 1892.

† M. Bogdanovitch speaks of *three*, but he includes Hayward who was not a geologist. Hayward's earlier training was that of a soldier, and he took up exploration from a general love for geographical science, not as a geologist.

extend in almost unbroken continuity for thousands of miles, where the uplands of Tibet and the plains of Kashgaria oppress the traveller from their very vastness.

Maps constructed after the most improved methods may give an idea of the leading physical features of the country, and enable one to take in at a glance immense tracts; but to realise the magnitude of Nature's work in Central Asia, to learn its aspect, it is necessary to visit and travel in these regions.

Leaving the Russian town of Prejevalsk on May 25th, 1889, M. Bogdanovitch, escorted by a Cossack interpreter, Shestakof, and two Kirghiz guides crossed the Tash-Rabat Pass (about 13,000 feet), and proceeded *viâ* Turugart to Kashgar. From this city he made an expedition to the Mustagh-ata* group with the object of studying its geology. To reach these mountains it was no longer possible at so advanced a season of the year to follow the valley of the Gez which traverses their whole width from west to east, and flows close under Mustagh-ata itself, for the rivers were already flooded with melted snow and ice. Neither was it possible to hire guides for the Kashgarian mountains. He therefore went first to Yanghi Hissar, and here with the obliging assistance of M. Petrofsky, the well-known Russian consul, succeeded in hiring men and pack animals for the transport of his supplies and forage, for at that season supplies were not procurable on the Pamirs. The little Karakul route by way of the Kara-tash Pass † was that chosen. Passing along the King-gol (Kinkol) and Ridjek streams he reached the foot of the Ridjek-dawan Pass (about 14,000 feet) on June 7th. Here he was delayed a day owing to the excessive steepness of the Pass. At length the baggage-horses were safely over, and the journey was continued with comparative ease for upwards of 20 miles, at first down the Chat-su, then up the Kara-tash-su to the Kara-tash Pass over the Mustagh-ata. The Kara-tash Pass (16,500 feet) under the best of circumstances is reputed to be the most difficult in the eastern border-land of the Pamirs. However, by hiring yaks of the Kirghiz, and favoured by splendid weather, the ascent was accomplished on June 9th without difficulty, after turning the gigantic moraine of a glacier, now hidden in the recesses of the defiles in the southern group of Mustagh-ata. Very little snow was left on the summit of the pass, but the descent towards Kara-kul was most difficult, the path for upwards of 13 miles clinging to the side of the mountain along huge slopes of detritus. Having skirted the south shore of little Kara-kul (about 12,500 feet) the party made their way round the western foot of the southern group of Mustagh-ata, separated from the northern peak by the gorge of the Iki-bel-su. The position of the little Kara-kul valley is compressed between the slopes of Mustagh-ata and the wall-like, granitic range of the Sari-kol mountains on the west. On the east, however, there is room enough for the Iki-bel-su to wind its course between the lake and the mountain much in the same way as the Chu approaches Issik-kul without mingling its waters with that lake. On the south and south-east of Kara-kul a gravelly, saline plain extends to some granitic heights connecting Mustagh-ata with the Sarikol range. These heights drain into the river—not by narrow water channels but by broad streams of a temporary nature descending the mountain sides. Having united at the foot of the mountains they flow in a wide, slightly inclined channel, at times over the perfectly level plain. The gravelly deposits formed by this system of drainage may be compared with those of Khorassan, the higher valleys of Tibet, and other valleys in the Pamir itself. Their irregular stratification may be attributed to the periodicity of the floods and varying volume of water discharged, though they might easily be mistaken for glacier-drift.

* The Tagharma Peak of the maps.

† The route is mentioned by Trotter in the Report of the Mission to Yarkand, p. 265.

M. Bogdanovitch passed into the valley of the Tagharma by the Ulugh-Rabat Pass. Here he learned that there were no roads along the Yarkand-daria by which he might proceed to Yarkand, but only foot-paths, and that from the middle of June to the end of July, and even late into August, the rivers were unfordable. As the date for his rejoining the main expedition was fixed for June 22nd, he had to decide on the route *viâ* the Kok-moinak and Chichiklik Passes, and content himself with a survey of only the central portion of the Kashgarian Mountains.

The Kok-moinak Pass (about 15,000 feet) leads over the southern lower part of the Mustagh-ata group; the descent from this pass opens on a circular expansion of the Upper Dorshat-su Valley, separated by the low Chichiklik Ridge from the Tarbashi-su (tributaries of the Yarkand-daria). These valleys have all the characteristics of glacier-channels, with typical alluvial deposits in their lower parts very similar to those of the Kara-tash-su below the last Kirghiz camping-ground. Their higher valleys are specially selected by the Kirghiz for their summer pasturages, and it is only after the intense heats are over that these nomadising inhabitants descend below the great beds of detritus and the desolate transverse defiles to warmer quarters. Huge boulders of granite occur between the last camping-grounds and Pas-rabat. These and the rush of the torrents oblige the rider to dismount, and let his horse pick its way as best it can, while he wades in deep water, now climbing on to the blocks, now ascending the steep banks of the channel to escape being swept down by the stream. Here, in the very wildest part of the defile, M. Bogdanovitch came upon warm springs,* slightly ferruginous, with a temperature of 127° to 135° Fahr. They rise from thick masses of conglomerate rock overlying granite and crystalline schists.

From Pas-rabat our traveller rode *viâ* the Turut (Torut) Pass (about 13,000 feet †) to Chehil-gumbaz,‡ and descended the valleys of the Charling and Kaiz to Kuserab, a settlement on the Yarkand-daria, marked in his map as the site of a coal-mine.

In the valley of Tagharma there are several settlements of Tâjiks (*e.g.* Besh-kurgan and Chashman), known here as Sari-kolis. In winter they are concentrated near Tash-kurgan, and are also met with at Kuserab. They are distinguished from the inhabitants of the Kashgarian oases by their distinct Aryan type, and by their speaking Persian.

The Tagharma Valley is a wide pasture-land,§ visited in spring by thousands of Kirghiz from the neighbouring mountains; here and there are plots of arable land cultivated by Sarikolis, whose invariable corn-mills have given the country its name—Tagharma, *i.e.*, “corn-mill.” Near Pas-robot, between Chehil-gumbaz and Kuserab, beyond the Kara dawan (11,000 feet) and Kizil dawan Passes, and in the valley of the Arpalik-su, wherever the valleys widen the Kirghiz pasture their flocks. Barley || is the only corn which ripens.

On June 19th M. Bogdanovitch arrived at Yarkand with his tired-out horses, having accomplished 305 miles in fourteen days, over the worst of mountain paths. Here he rejoined the expedition under General Pevtsof, and

* Warm springs were noticed by Colonel Gordon with a temperature of about 116°, *cf.* Report of a Mission to Yarkand, p. 223.

† Colonel Gordon gives the height at 13,400 feet, *cf. ib.* l.c. Trotter gives Torat (horse's sweat) as an alternative name for the Pas-robot Pass, *ib.* p. 206.

‡ Or “the forty domes,” *cf.* Report of a Mission to Yarkand, p. 222.

§ About 12 miles long by seven broad, extending from the south-west to the north-east, according to Gordon. Report of a Mission to Yarkand, p. 224.

|| A beardless kind, *ibid.*

accompanied it as far as Takhta-Khon in the mountains south-west of Kok-yar, whither they proceeded to recruit their tired camels. Leaving it once more at Takhta-khon he set off on another expedition to explore the mountains aligning the upper course of the Yarkand daria and advance as far southwards as circumstances might permit.

However few the itineraries of European travellers in the mountainous region bordering on Chinese Turkestan, the tract south-west of Yarkand has not been unexplored. The caravan route from Yarkand to Ladak, passing Kok-yar, Ak-Meshet and Akchi-Kabak, though easier than that *via* Sanju, has been abandoned, owing to the depredations of the Kanjutis. It was by this route that Forsyth's mission returned to Ladak in 1874, crossing by the Yanghi-dawan Pass, the easiest in this part of the Kuen Luen, into the Yarkand daria basin. Other passes are mentioned by Adolph Schlagintweit from hearsay information and by Grombchevsky, who approached the Yarkand daria (Raskem-daria) from the west in 1888. M. Bogdanovitch decided on exploring one of the passes between the Yanghi-dawan and Kurumat-dawan, hitherto entirely unknown.

On August 3rd, taking with him the same trusty Cossack, Shestakof, and two experienced natives he set out from Kok-yar, with a supply of bread and barley to last twelve days. Crossing the Tiznab at Mumuk he advanced along the valley of this river fording a number of its left affluents—the Gusás, the Usiás, the Chikhsho with its tributaries, the Yolun, Bolun, and the Pakhpu. The scenery here is very picturesque and the country comparatively fertile. Here, for the first time after leaving Russian territory, he saw fine forests of great extent and alpine meadows above the belts of forest land. The inhabitants of the Tiznab valleys are Yarkandi-Taghlyks (mountaineers) leading pastoral lives. In summer they usually drive their sheep and cattle to the alpine meadows near the sources of the streams, descending again in autumn and winter to the more central parts of the valleys where their permanent habitations, built of clay, are situated.

The Taghlyks of the Tiznab are emigrants from the west and are easily distinguishable from the aborigines, *e.g.*, the Taghlyks of Russian range (known to us by Prejevalsky's description as Machinians) by their pure Tajik type.

At the tenth march from Kok-yar M. Bogdanovitch reached the source of the Pakhpu at Koi-yailak at the foot of the Takhta-korum Pass. Here he hired pack animals, and on August 25th began the ascent of this magnificent pass, leading across the principal chain of the Kuen-Luen. At 14,000 feet he found the soft loess replaced by rock detritus. Toward the summit mountains close in from every side to form a vast amphitheatre, entered by a giant staircase of natural steps of great width, slightly inclined and studded with blocks of fallen rock. The character of the scenery agrees well with the name—*Takhta-korum*, Persian for "rocky throne."

The ascent of the pass occupied eight hours of difficult climbing. Half way up their heads began to ache, giddiness was felt, and one of the guides expectorated blood. The hypsometer showed $T = 182^{\circ}$ Fahr., and t of the air = 39.2° Fahr. (about 17,000 feet). Masses of snow were only met with immediately below the summit where freshly-fallen snow was lying; in summer the pass is quite free from snow. The descent on the opposite side is very abrupt, lying over beds of detritus at an angle of 40° , into the deep valley of the Kulan-aghul (or Kulan-aryk), a right tributary of the Yarkand daria. Beyond the valley rises a snow-clad range with another terraciform ascent, though less remarkable than the Takhta-korum. M. Bogdanovitch crossed this range by the Kokelan Pass (about 17,000 feet—the snow line) and descended by the Malmum-bash gorge and the valley of the Bazar-dereh, a right affluent of the Yarkand daria. This is a raging torrent of dirty water, 30 to 40 yards wide, and

quite unfordable. It was hoped that by waiting till daybreak the waters might subside and become clearer so as to enable them to see the bottom; but this expectation proved vain, for when the morning dawned the torrent was, if anything, higher, and dashed its waves furiously against the schistose rocks. Yet to reach the sources of the Tiznab by the Yanghi-dawan and Chirak-saldi Passes it would have been necessary to cross the river five or six times. An attempt to circumvent the river by scaling the mountain side was unsuccessful and nearly terminated fatally, for M. Bogdanovitch slipped on the first detritus slope, and was only rescued from headlong descent to the precipice by the timely aid of his companion. This mishap decided him on tempting fortune no more, but to return the way he had come, *viâ* the Malgumbash and Takhta-korum Pass.

His second attempt to cross the Yarkand-daria was equally unsuccessful, and he then learned from the inhabitants that the only season of the year when this valley was accessible for horse and rider was the winter, and that in summer and autumn, not even at the villages of Pihl and Kuserab, could its stream be crossed. Above Pihl, visited by Grombchevsky in 1888, there are no settlements along the Yarkand-daria. Ruins of former villages may be seen occasionally, for instance at Ish-debeh on the Bazar-dereh above its confluence with the Yarkand-daria, a place where there had once been iron smelting works. M. Bogdanovitch did not discover the exact locality whence the iron ore, a brown ironstone, had been obtained, but the clay schists in the neighbourhood were found to be highly charged with ferruginous deposits. Many parts of the Yarkand-daria bear traces of smelting works like those at Ish-debeh, and the abundance of iron has, according to Grombchevsky, originated the names Raskem-daria, from *ras*-much and *Kau* mines. In this part of its course the river discloses to view metamorphic deposits of iron ore in very much disturbed schists of the Devonian series. The Arab geographers of the eighth to the eleventh centuries, and especially Edrisi, mention that Eastern Turkestan supplied the Western Mohammedan world with iron and iron-ware.* At the present day, however, only one of the mines of this brown ironstone, situated in the mountains south of Yanghi-Hissar, is worked.

These mountains aligning the Raskem-daria also abound in jade deposits. One of these, Shanut, on the northern slope of the Kuen Luen, was visited by Bogdanovitch. Copper is found at the confluence of the Yanghi-dawan-su and Tash-Kurgan-su (head waters of the Tiznab), and the metal obtained is minted. Our traveller had no opportunity of visiting this or the copper-mines of Kucha and Urumchi, known only by hearsay report. The copper-mines of the Tian-shan, between Aksu and Urumchi, were known in very early times, and were mentioned by Hwen Thsang, as well as lead, sulphur and alum. These mineral deposits are also spoken of in the history of the earlier Han dynasty in the first century, and Bogdanovitch considers the numerous traces of copper smelting observed by him refer back to the pre-historic age and possibly to the great migration of races from east to west.

The valley of the Yarkand-daria, near Ish-debeh, is comparatively narrow and diagonal or transverse with respect to the mountain chains as far as Pihl. Above the Yanghi-dawan road, however, it widens, and is evidently longitudinal. Though pasturage is abundant it is never visited by the inhabitants of the Tiznab Basin, who dread the Kanjutis. These marauders make their appearance in winter, descending from the Mustagh Range, where they leave their flocks and herds in some place of security while they themselves ascend by the Takhta-korum to the valleys of the Pakhpu and Chikhsho to collect tribute in the shape of cattle and money. Four years had elapsed since their last appearance. The inhabitants have come to regard

* Russ. ed. of Ritter's 'Asia,' E. Turkestan, ed. by Grigorief, ii. 225.

this tribute as obligatory, and collect it themselves in readiness for the Kanjutis, who are so much dreaded, that it was with great difficulty that Bogdanovitch could hire men at Pakhpu to go with him to the Malgum-bash.

The point where he struck the Yarkand-daria is some distance above Uprang, visited by Grombchefskey, and a long way from the sources of this river in the Mustagh Range, judging from the fact that the melted glacier water does not reach Ish-debeh before the morning. The sources of the Yarkand-daria have been described by the Brothers Schlagintweit; Grombchefskey crossed the Taghdumbash (Dangnin-bash) heights of the Mustagh, and Younghusband explored the now abandoned Mustagh Pass, so that very little remains unexplored of this range, except where the Yarkand-daria takes a sharp turn to the eastward. This particular locality is absolutely unknown.

The two head-streams of the Yarkand-daria, the Raskem-daria and the Taghdumbash-daria, unite below the village of Kuserab. On June 16th Bogdanovitch observed the second of these rivers to be smaller, narrower, and shallower at Kuserab than the Raskem-daria at Ish-debeh on August 27th. Unfortunately no contemporaneous observations were made, and therefore no positive conclusions could be formed. The Yarkand-daria is the chief river of Eastern Turkestan; its course is upwards of 1300 miles long, and the determination of its sources is an interesting geographical problem.

On August 30th, M. Bogdanovitch and his party reached Pakhpu, after three heavy days' marching on foot, extricating their worn-out horses with great difficulty from the rocky defile of Malgum-bash and the detritus-covered slopes of Takhtakorur. From Pakhpu two long marches over the Ishekat (about 14,000 feet, here they had to rope the horses) and Ak-korum Passes brought them to Expedition Camp. In nineteen days of itinerary they had gone 280 miles. They had examined the orography of the region visited, and had found that in this part of the Kuen-Luen the ranges change from a N.E.-S.W. direction to N.W.-S.E., forming an arc. The number of peaks and groups massed together to the east of Takhta-Korum and in other parts made it impossible to have a correct idea of the orography, the ramifications of separate chains, and their interlacement. This too explains the absence of any definite local nomenclature. The mountains are called after the rivers flowing below them (*e.g.* Pakhpu-tagh, Chikhsho-tagh, Gusas-tagh, &c.), or after the passes (Takhta-korum, Kulum-bagh, &c.), sometimes even after villages, and it not unfrequently happens that a mountain obtains different names from the inhabitants of separate valleys. Combined with this characteristic in the mountains is the complete absence of longitudinal valleys. Nearly all have either a diagonal or transverse direction with reference to the axis of the nearest chains, *e.g.*, all the left tributaries of the Tiznab. Pointed peaks, groups of jagged, snowy summits, now and again a well-defined snowy chain, the prevailing lines of the valleys with their much lower aligning hills, these are general features of the panorama. Towards the west, however, where the direction changes to N.W.-S.E., the scenery changes. The Chup and Kulan flow through distinct longitudinal valleys between the snowy ranges of Kulum-baghla, Takhta-korum, and Kokelan. The second of these forms the watershed between the basins of the Tiznab and the Yarkand-daria. South-east as far as Yanghi-dawan the mountains appear as a very lofty snowy mass, feeding the sources of the Tiznab (the Yanghi-su and Tashkurgan) and the right tributaries of the Yarkand-daria (the Kulan-aghil and Bazar-dereh). The extension in an east-south-east direction of this main chain of the western Kuen-Luen is the lofty Arpa-vash-tagh, crossed by the high road to India at the Kilian Pass.

I have only mentioned in this short paper a few of the topographical results of

the Pevtsof Expedition. The observations made were of the most varied kind, and have thrown much light on the mineral and other resources of the regions visited. Among these, special attention is drawn to the part taken by the poplar forests in Eastern Turkestan in protecting the fertile tracts from the ravages of shifting sands, and to the system of irrigation adopted by the inhabitants, who allow their fields to remain coated with ice during winter, in order to ensure an early supply of moisture in spring for cultivation. The jade quarries and deposits, and the different kinds of this stone, precious to the Chinaman, are noticed at some length, and the information collected supplements the observations of the Brothers Schlagintweit and the late Dr. Stoliczka. A separate chapter treats of the gold placers and the manner of working these, celebrated since the time of Herodotus.

It is worth while remarking that, in M. Bogdanovitch's opinion, the only chance of penetrating into Tibet from the north-west is by travelling on foot, without any beasts of burden, the necessity for taking forage for these increasing their number without any advantage resulting from them. Donkeys, of course, would be the most serviceable, and he recommends making a start from Karasai, where animals, supplies, and men may be obtained. Water is always procurable under the surface in low spots between the ranges; and, if this should fail, snow-storms, of such frequent occurrence even in July, would supply all that was necessary. The best season for such an expedition, he says, is from July to September. But, on the whole, he would prefer Ladak as a base, an entrance being made into Western Tibet *viâ* Rudok or Tankse, *i.e.*, by the route recently followed by Captain Bower.

In conclusion let me say that the map to illustrate this paper has been most carefully compiled from every available source of information, and has been executed by Mr. Scharbau, the Society's draughtsman.

NOTE ON THE MAP.—We may add that the map referred to above is part of the general map of Tibet, now in preparation for the Society. With this have been combined the surveys of Colonel Pevtsof and M. Bogdanovitch, as published by the Imperial Russian Geographical Society in the *Isvestija* and the 'Memoirs of the Tibetan Expedition,' Part II. The yellow portions on the maps indicate sand.

THE MONTHLY RECORD.

EUROPE.

New Geological Map of European Russia.—The Russian Geological Committee has just published a beautiful geological map of European Russia, in six sheets, on the scale of 60 versts (40 miles) to an inch. The last geological map of Russia was compiled by Helmersen in 1873, and is now old. Therefore the Committee, in commemoration of its ten years' existence, has prepared this map, which embodies all explorations up to date.

The Black Sea in Pliocene Times.—M. Andrussof gives a note on this subject in the *Bulletin de l'Acad. Imp. des Sciences de St. Petersburg* (1893, p. 437). While it is generally agreed that the basin of the Black Sea was separated from the Mediterranean in the Pliocene epoch (the *Ægean* being then dry land), its condition at that time is still a disputed question. From the presence of Sarmatic and Pontic deposits on its shores, M. Andrussof has long held that some part at least was then covered by water, while the nature of the fauna disclosed by certain deposits discovered by him in the Crimea leads him to conclude that the area was occupied by a large brackish lake, similar to those of the south of Russia. This view is supported by the dredgings carried out by the expedition of 1890, of which the writer was a member. The empty shells of brackish-water species, which alone were

brought up from deep water, differ from those of the present estuaries, but agree closely with those of the Caspian, to which the basin probably bore much resemblance. The question of the mode of formation of the Bosphorus and Dardanelles is difficult to decide; but M. Andrussof inclines to the opinion that they existed as river-channels as far back as early Pliocene times.

Cartography in Finland.—The Geographical Society of Finland has lately taken decisive steps for the construction of a reliable map of the country on a sufficiently large scale. A specially appointed Committee has drawn up an elaborate report which is now published in the Society's journal *Fennia* (1892, No. 6). The report gives first a review of the cartographic work hitherto done. The chief material for a map of the country is contained in the parish maps on the scale of 1 : 20,000, which were connected together and reduced into maps of the districts or *härads* (scale 1 : 100,000). These maps, prepared by the Economical Survey Administration, had, however, no satisfactory relation to astronomically or geometrically determined points, and the next task was to make such determinations. They were made at sixty-six different stations, and with the aid of the data so acquired an excellent general map was published in 1862–73, on the scale of 1 : 400,000, in thirty sheets. On the other side, the Russian General Staff has made for years past very accurate surveys and levellings in South Finland, various hydrographical maps have been prepared by the Administration of Ways and Communications, and various geodetical and astronomical works, precise levellings, and geological maps have also been completed. All the results so obtained are graphically represented on the maps which accompany the report. The report next discusses the degree of accuracy of these different works. In the general map there are errors of from 1' to 4', and occasionally as much as 8' 20" in longitude. The distances between separate stations are subject to errors of from 1 to 5·4 per cent. of the distance. The scheme elaborated by the Committee for further work includes, first of all, a good trigonometrical system in addition to the net of the meridian measurement and the one accomplished along the 60th parallel. Two lines of triangulation of first-class triangles crossing Finland from north to south and two lines running west and east are therefore proposed. They must be supported by a number of astronomical determinations, and precise levellings have to be made along all railways. These data will be used for the construction of a fundamental map on the scale of 1 : 20,000, as far at least as 63° N., while the northern parts of Finland may be mapped on a smaller scale. The polyhedric projection is advocated, each sheet of the map covering 6' of latitude and 12' of longitude. The appointment of a special Geodetical Committee is insisted upon, all cartographic work to be based in the future on the geodetical net work.

North-German Coniferous Forests.—In a recent issue of *Forschungen zur deutschen Landes- und Volkskunde*, Dr. F. Höek examines the general flora of the coniferous forests of North Germany, confining himself to this section for the present in order to limit the scope of his enquiry. Of the five species of conifers, which alone seem indigenous in the region, the yew occurs only in isolated localities, while the juniper hardly ever covers continuous areas as a tree. The limits of the extension of the three forest-forming species, run broadly from south-west to north-east, none being found wild in the extreme north-west. The pine has the widest extension, and in former times reached still further than at present. The Norway spruce and the silver-fir do not extend far over the plain, except in Silesia, belonging more properly to the mountainous parts. The author devotes most attention to the flora of the pine-woods, and gives a list of those which his researches prove most characteristic, proceeding next to investigate the limits of distribution of the

various species, as compared with that of the pine. The result is to show a remarkable agreement in the case of a large number, and Dr. Höek concludes that a real relation exists between the leading type and the associated species. In the case of many plants whose range in Germany is wider than that of the pine, the general distribution over Europe agrees more closely, and it seems likely that when (perhaps owing to a change of climate, caused by the irruption of the sea into the English Channel) the pine retreated from the north-west, other plants adapted themselves to the altered conditions, some now dispensing with the shade and forming heaths, while the true forest plants sought the shelter of deciduous trees. A map is added showing the distribution of the various species of conifers.

The Expansion of Vienna.—The late extension of the limits of Vienna, in December, 1890, gives occasion for a sketch by Professor Umlauf, in the *Deutsche Rundschau*, of the gradual expansion of the city from early times. The important part played by Vienna as an outpost against various invaders from the north and east makes its history of special interest. The seat of a Celtic settlement, when, in B.C. 15, the Romans extended their sway to the Danube, it became, under the name *Vindobona* (Celtic Findbonn), one of a series of forts placed as a check on the inroads of the barbarians to the north of that river. From the researches and excavations of Von Camesina, Von Hauslab, &c., it appears that, though enlarged under various emperors, it remained confined within very narrow limits during the Roman occupation, its importance centering in the modern "upper market" near the Danube canal. For some centuries after the Roman evacuation little definite is known. A Slav settlement seems to have been formed in the neighbourhood, as is indicated by the Slav name of Beč, still applied to the city by a section of that race. It again comes into prominence under the Franks, after the foundation of the "Eastern mark," as a barrier to the inroads of the Hungarians; and under the rulers of the House of Babenberg churches and monasteries began to spring up, the limits being gradually extended, until in 1282, when the sway of the House of Hapsburg began, it had almost reached the limits of the subsequent "Inner city." For some centuries later little growth is to be recorded; the city itself remained confined within its fortifications, though at some distance outside these important suburbs arose. These, however, all succumbed to the flames at the time of the second Turkish siege, in 1683, the then ruler causing them to be destroyed to prevent their affording shelter to the invaders. Having soon sprang up again and rapidly increased, after the departure of the Turks, they were enclosed within a new rampart at the instance of Prince Eugene, when (1704) the city was threatened by the French and Bavarians in the war of the Spanish Succession, the city thus attaining a far greater size than any previously. In 1858 Francis-Joseph I., by his order for the demolition of the walls of the "Inner city," removed what had been a great check to expansion. To the eight districts then formed, two more were annexed in 1861; while the latest extension in December, 1890, included an extent of suburbs larger than the whole previous area of the city, which hereby gained nine other districts, and attained to the second place among European capitals for extent of ground covered. The various stages are clearly shown on the map accompanying the note.

Frankfurt-on-Main.—The first part of a statistical description of Frankfurt-on-Main, illustrated by maps, and dealing chiefly with the growth and distribution of population and the occupations of the inhabitants, has lately been brought out under the auspices of the Statistical Office of that city. The population, which was only 41,458 in 1817, amounted in 1890 to 180,020, the increase having been especially rapid of late years, though not above the average for German towns,

except during the period 1875-80. The progress of house-building is clearly shown on the large general map (which also shows the 33 official divisions of the city), besides being illustrated by diagrams. Noteworthy points are the tendency to increase the number of storeys in the houses, and the number of separate dwellings in a building. A comparison of the number of houses in different quarters of the city in 1890 with that in 1761 shows that in the *Altstadt* (the most central portion) it has slightly diminished, while in the *Neustadt* (the zone immediately surrounding the former) the increase has been great. The speedy diminution in density of population in successive zones, compared with that in other large towns, is remarkable, that of the centre being unusually high. Counting only the area actually occupied by houses, one of the outer divisions (towards the suburb of Bornheim) stands first, the reason being the number of many-storeyed lodging-houses and the few business premises.

AFRICA.

Sir Gilbert Carter's Mission into the Lagos Interior.—The route followed by Governor Carter's party into the interior was by way of Abeokuta, Iseyin, Oyo, Ilorin, and from thence to the Niger. The return was over the same ground as far as Ilorin, from whence the party turned to the south-east, and passed through Ikirun, Osogbo, Ede, and Ibadan to Lagos. During the whole of the time, from Jan. 2nd to April 4th, the weather was favourable, and though small-pox was rife in some districts, neither of the five white men were ill. Mr. Fowler, the surveyor, who accompanied the mission, carried four watches with him, and during the whole of the journey the greatest discrepancy between them was ten seconds. The positions of fifty-seven places were fixed, and the survey agreed at the Niger with the Admiralty chart. The latitude and longitude of many places, as laid down on previous maps, are considerably in error, which necessitates some important changes in the map now in course of construction by Mr. Fowler. The natives were, on the whole, very friendly, and all the country up to the Niger was found to be thickly populated, though numerous ruins of deserted towns were met with.

German South-west Africa.—At the tenth meeting of German geographers (Stuttgart, April 1893), Dr. A. Schenck of Halle read a paper on the orographical and geological features of German South-west Africa. He has found that Damaraland and Great Namaqualand—which are composed of mountain ranges gradually sloping down towards the Kalahari desert—principally consist of two formations, viz., of granite and gneiss, and of the so-called table-mountain formation. The latter forms peculiarly-shaped sandstone mountains, which are of sedimentary origin. They usually appear in the form of broad prisms and truncated cones, and are probably the remnants of former uninterrupted plateaux, which have gradually disappeared through erosion. Near Angra Pequena the Table Mountains commence not far from the coast, a little east of Aus, and extend to the Fish River and its tributaries. Here they form the Huib and Han-ami plateaux. These mountains consist not only of sandstone, but also of clay slates, quartzites, etc. To the south extend the plateaux of the Orange River. In Damaraland the gneiss and granite formations prevail, and the Table Mountains gradually narrow. As regards decomposition the Table Mountains are much less under the influence of denudation than are the granite and gneiss formations. Winds, especially the south-west winds near the coast, are an important factor in forming and transforming the orographical features of German South-west Africa.

The Algerian Sahara.—M. G. Rolland reports to the Geographical Society of Paris the results of his work at Hassi-Inifel in the extreme south of Algeria,

93 miles south-east of El-Golea in the upper part of Wed Mya a little before its junction with Wed Insokki. An expedition in 1881 dug a second well in the bed of the valley to the depth of 20 feet, but the yield of water was barely half a gallon a minute. Hassi-Inifel is not near any of the caravan routes, but it is one of the strategic points between El-Golea and Insalah. A letter from El-Golea (January 16th, 1893) reports that the borings at Hassi-Inifel were proceeding with great ease in a soft soil, but that no trace of water was found at a depth of 114 feet. M. Rolland, while protesting against the ideas formed by the success of previous borings at Wed Rir, Wargla, and El-Golea, considers that Hassi-Inifel is one of the best points to select for these experiments, but he does not think a flowing supply can be got unless the borings are extended to a depth of 1000 feet.

Commercial Condition of Suakin.—From the report on the trade and commerce of Suakin for 1892 recently issued, we learn that during the year there was a decrease in the import trade with the exception of timber, while the export trade had largely increased. The exports from Suakin include gum, senna, the best quality of which comes from the north (near Rowayah), mother-of-pearl, found near Mersa Halaib (lat. 23° N.), where also pearls are occasionally obtained, ivory, and, for the first time for many years, cotton, although of an inferior quality to that grown in Lower Egypt, the greater portion of which was exported to Egypt and India in an uncleaned condition, that sent to other countries being cleaned by hand in Suakin. The Tokar cultivation is dependent upon the course of the Baraka flood, which commences at the end of July or beginning of August. A large quantity of salt was also extracted last year from the salt-pans at Rowayah (lat. 21° N.), the greater part being sent to Bombay. Minerals have been found in the mountains of Erkoweit, as also in the Erba Mountains to the north. Suakin possesses a land-locked and commodious harbour, approached by a narrow passage between the reefs, which requires great care in navigating. The present population of Suakin is estimated at about 11,000. The principal cultivation is the melon-plant; the date-palm is also said to grow well. The wild-fig grows at Suakin, Sinkat, and Erkoweit. Rain is said to have fallen last year in July. The hot season broke early in November. The maximum shade-temperature for the year was 114° Fahr., the minimum 66° Fahr.

Types of Fortification in Africa.—Dr. L. Hösel deals with this subject in a recent number of *Globus* (vol. 63, No. 9). Although some tribes in Africa retire before their foes to inaccessible retreats, as a general rule the inhabitants guard against hostile attacks by defensive measures. These consist (1) in making access to their settlements as difficult as possible; and (2) in surrounding the same by protective ramparts. The forest-clad regions afford the fullest scope for the former method, by concealment and circuitous approaches; barriers, pitfalls and stakes being used to make the approach dangerous to a foe. In open country villages are placed on steep hills, and the entrances are made as low and narrow as possible (e.g. Taveta), and closed by wooden doors barred on the inside. Surrounding ramparts may be either walls, palisades, or hedges. The first are seldom of stone (rare instances are mentioned by Barth and others). Clay walls are the rule, and are found chiefly in the northern half of the continent, which has been subject to foreign influence, palisades, etc., taking their place further south. Those of Kuka are 20 feet high, and those of Kano as much as 65 feet. They are sometimes double, and owing to diminution of population or other causes, a smaller space is sometimes (as in the case of the capital of Baghirmi) walled in within the original area, which may have included a wide extent of fields, etc., the outer wall then falling into decay. Several concentric circles are sometimes seen, especially in Upper

Guinea, and their protective power is increased by masses of thorns at the top. The palisade may be replaced by barricades of thorns or by living hedges of the same, affording an excellent protection against arrows. Hedges of *Euphorbia*, whose poisonous juice adds to its effectiveness, are much used in East Africa.

Central African Place-Names.—Mr. D. Crawford, in his diary, now being published in *Echoes of Service*, points out that the greater number of the names given on maps of Central Africa are positively erroneous, while others have only a very remote likeness to the real names as used by the natives. "For instance," he says, "the Koni mountains, reputed to be on the east side of the Lufira River, do not exist, there being only one mountain of that name—a peak—about 20 miles south of the old capital on the road to Ntenke's and west of the Lufira. The Viano or Mitumbwa mountains sounds very strange, 'Mitumba' being the plural of 'mountain,' and 'Viano' meaning prairie land or plains. Regarding 'Ourowa,' it seems almost incredible that this is intended for the great Luba country, which, while it extends to the Luapula River, is by no means limited to the small portion assigned to it on the map. 'Iramba' is the Lamba country. Bun Keya is the name of the old capital. 'Kundehungen,' as applying to the great range on the east of the Lufira, requires a word of explanation. It strictly refers to the top of the range, which is a great prairie stretching on to the Luapula, and means 'there at the prairie.'"

AMERICA.

Documents relative to Behring's Expedition.—The Government of the United States having asked the Russian Government to send to the Chicago Exhibition all documents "relative to the journey of Captain-Commander Vitus Behring in 1738-1742, during which journey Alaska was discovered," the Russian authorities have done their best to discover such documents. The reports relative to this second expedition of 1741, made on board the packet-boat *St. Peter*, could evidently not be in Behring's handwriting, as the illustrious traveller died on December 8th, 1741 (o.s.). The report was written by Lieut. Waksell, and, together with a map and the log-book of the *St. Peter*, it was forwarded to the Russian Admiralty, as well as the report of Capt. Chirikoff, who was in command of the packet-boat *St. Paul*, under Behring. Waksell's reports were received safely at the Admiralty, and happily were copied there several times; but the originals have disappeared. It is supposed that they were sent in 1754 to Irkutsk, whence they were forwarded in 1759 to Tobolsk. There they must have been destroyed during the conflagration of 1788. As to the copies, the following have been found: (1) Two copies of the log-book of the *St. Peter* for the year 1741, and two copies of the log-book of the boat which was built on Behring's Island from the wrecked packet-boat, was also named *St. Peter*, and reached Petropavlovsk in 1742; (2) One copy of the chart of Behring's journey to the American coast, compiled from Waksell's report, copied from the original in 1744, and compared with it in 1754; and (3) Three copies of Chirikoff's log-book of the *St. Paul*, for 1741 and 1742, and one copy of his journey to the American coast and to Behring's Island. Moreover, in different bundles, various documents signed by Behring, Chirikoff, and other members of the expedition, were discovered. They relate to the building of the two boats, the *St. Peter* and *St. Paul*, at Okhotsk. The chief document is Chirikoff's report on his journey to the American coast, and an abstract from Waksell's report on the same. The last of Behring's reports was signed on August 29th, 1740—the great captain expressing his confidence in being able to leave for Avacha with the first proper wind. All these documents have been sent to Chicago, together with a printed memoir, in English, summing up the matter, and containing abstracts from the reports.

Dr. Carl Lumholz's Recent Researches in Northern Mexico.—The first number for the present year of the *Bulletin* of the American Geographical Society contains a letter from Dr. Carl Lumholz, in which he gives a brief account of his recent ethnological researches among the little-known Tarahumare Indians of Northern Mexico. These interesting people are for the most part cave-dwellers, although not apparently related with the cave and cliff-dwellers of the United States. They live in the *barrancas*, which resemble gigantic cracks from 3000 to 4000 feet deep, which traverse the Chihuahua portion of the Sierra Madre from east to west. They appear to be entirely untouched by Spanish influence, and follow their own primitive habits and customs. They are said to be extremely timid, small in stature, but well-formed and muscular, very active, and able to endure exertion. On his recent return from the border, towards the State of Durango, Dr. Lumholz ascended the Cerro de Muinora in the southern neighbourhood of Guadalupe y Calvo, probably the highest mountain in Chihuahua. At the time of writing, he was then on his way to Nabogame and Baborigame, where the Tepehuanes Indians live, and from there he intends to extend his researches to the numerous *barrancas* and *arroyos* (streams) that traverse the western part of the Sierra to the north, where the most primitive Tarahumares are to be found.

POLAR REGIONS.

Dr. Nansen's Polar Expedition.—Dr. Fridtjof Nansen with the members of his expedition sailed in the *Fram* from Christiania at half-past twelve p.m. on Saturday, June 24th. Large crowds lined the quays, and bade the explorers a hearty farewell. The expedition, as is known, intends to attempt to cross the North Polar area by making for the New Siberian Islands, and getting into a current which Dr. Nansen believes drifts across the Arctic region in the direction of Greenland. The *Fram* will call at Bergen and one or two other ports in Norway for the purpose of taking in supplies; she will be provisioned for five years. Whatever may be thought of the theories on which Dr. Nansen has based his plans, and however foolhardy the venture may appear to many, everyone must wish these worthy descendants of the hardy Norsemen of yore the success they deserve.

The Antarctic Whalers.—The *Balana* and *Active* returned to Dundee in the beginning of June, well-laden with sealskins and oil. The reports promised by the captains and surgeons have not yet reached the Society, but they are expected to be ready for publication in next month's *Journal*. Until the full reports reach us it would be inadvisable to give an opinion as to the geographical value of the observations made. The *Balana* did not apparently cross the Antarctic circle, but the numerous sketches made Mr. W. G. Burn Murdoch, the artist who accompanied her, will doubtless be a valuable contribution to our knowledge of the scenery of the southern ice. The *Active* appears, from the newspaper reports, to have done a little exploration, and her captain, Mr. Robertson, believes that he discovered new land, to which he has given names, taken mainly from the neighbourhood of Dundee and the owners and managers of the whaling vessels. No positions have as yet been made public. Dr. Donald, on the *Active*, and Mr. Bruce, on the *Balana*, took a number of photographs, and meteorological observations were carried on whenever the captains considered that it would not hinder the primary object of the voyage to permit them. Collections of plants and animals were also made by the surgeons subject to the same restrictions.

GENERAL.

Railways as a Test of Progress.—An extra bulletin has been issued from the Census Office, Washington, prepared by Mr. H. C. Adams on the railway

mileage of the world in 1890. The bulletin contains tables of statistics and results reduced to diagrammatic form. From these statistics Mr. Adams notes that out of a total of 370,281 miles of railway for the whole world, North America and Europe claim 319,802 miles; and even the mileage of Asia, South America, Africa, and Australasia is due to European efforts. He observes also that English-speaking peoples are responsible for the construction of more miles of railway than all other peoples combined. The United States contains 163,597 miles of railways, nearly half that of the whole world; no other country has progressed so rapidly in this respect, new railways being often demanded by the necessity of opening up land before settlement was possible. For the total mileage the United States easily heads the list; then comes Germany (25,969), France (22,586), Great Britain (19,939), and Russia (18,728); Persia with 11 coming last. In regard to railway mileage per 100 square miles of area, Belgium comes first with 28.23 miles of railway; Great Britain (16.42), the Netherlands (13.73), and Germany (12.44) follow; the United States comes eleventh with 5.51, while West Australia, which heads the list of mileage in proportion to inhabitants, has only 0.05 mile of line to every 100 square miles of territory. South America stands out as the most backward of all the continents claiming a European civilisation; the average mileage per 100 square miles of territory is only 0.24. In the table representing the proportion of miles of line per 10,000 inhabitants, the Australian Colonies occupy the first places—Western Australia has 112.95, South Australia 54.23, Queensland 50.69, Canada 30.35, New Zealand 28.78, United States 25.90, Tasmania 24.83, Asiatic Russia 20.70. Great Britain is twenty-third on the list with 5.17. The second group of tables also includes three diagrams, showing the growth of mileage from 1830 to 1890, the proportion to 100 square miles, and to 10,000 inhabitants. They refer exclusively to the United States, and to facilitate comparison the States are divided into ten groups. In the New England group more than half the present mileage was reached by 1860; in the Pennsylvanian group the mileage has increased with equal rapidity during each decade since 1860—this regular increase being due to increasing trans-continental traffic seeking an outlet to foreign countries. The Southern and Gulf States show a great increase during 1850–1860, and again between 1880–90, showing how the war arrested internal improvement in the south for nearly twenty years. The groups tributary to Chicago and St. Louis have increased more rapidly each decade. They now contain 66,500 miles of line, while in 1870 there were little more than 1600 miles constructed. The extremes in proportion to area are the Ohio group (20.93 miles of line to every 100 square miles of country) and the Californian group (1.61). In regard to inhabitants, the Wyoming group has 68 miles to every 10,000 inhabitants; while for the whole of the United States the average is 26.66 as against 3.84 for Europe. No doubt this difference is largely due to the greater density of European populations; but it also points to superior energy on the part of the Americans, since in the States there are 5.51 miles of line to every 100 square miles of land, and for the whole of Europe the percentage is only 3.62.

Origin and Distribution of Cannibalism.—While some writers have attributed the origin of cannibalism to religious motives, H. Henkenius (*Deutsche Rundschau*, vol. xv., p. 348) considers that hunger was the original incentive to the practice, which was afterwards persisted in from choice, the superstitious and religious aspects being later developments. Cannibalism seems to have prevailed to a considerable extent among the primitive inhabitants of Europe, and still more in America. The fact that no traces of it have been found dating back to palæolithic times, while the lower animals rarely devour their own

species, seems to show that a certain degree of intelligence was first attained. (With this may be compared the remark of Peschel that the custom is most prevalent among tribes distinguished by a certain social advance, such as the Monbuttu.) An enumeration is given of the various cannibal tribes in different quarters of the world at the present day, the probable motive in each case being indicated. While instances of resort to human flesh as food in times of famine are widely diffused, the most common motive seems to be the well-known superstition that by eating the heart or other part of an enemy—to which the practice is often restricted—his prowess is acquired. The almost entire freedom of Continental Asia from the vice is noteworthy. In Polynesia and in Central America it occurs most frequently in connection with religious rites. In the former region special preference is given to the eye of the victim. Human sacrifices, however, do not always lead to cannibalism, *e.g.*, not in Dahomé. While in many cases the flesh of relatives especially is eaten, this was viewed with abhorrence among the Maoris, who also forbade human flesh to women. Many tribes that were formerly addicted to the vice have now abandoned it, principally owing to the spread of Christianity.

The Russian Geographical Society's New Undertakings.—During the present summer the Russian Geographical Society is sending out the following expeditions:—Professor Krotoff will pursue the oro-geological exploration of the western slopes of the Urals in the southern part of Perm. The further study of the great magnetic anomaly at Bielgorod (Kursk) will be continued by Mr. Rodd. M. Iversen will make a series of pendulum measurements about Moscow, where a remarkable disturbance has been noticed, and M. Sokoloff will take the Society's pendulum apparatus to Berlin and Paris, in order better to connect the Russian measurements with those made in Western Europe. Herr Fritsche will make magnetic measurements in South Russia. In the domain of ethnography the chief expedition will be that of MM. Istomior and Liapunoff, who will visit various provinces of East and North-East Russia to collect folk-lore documents, and songs. M. Dobrotvorsky will begin the study of the manners and language of the Tsiganes of Smolensk. MM. Wolter, Hinken, and Pogodin will continue their Lithuanian studies; MM. Pyevin and Lyeskoff will make ethnographical researches in Olonetz, and M. Peretz in the Government of St. Petersburg. The two great expeditions of M. Potanin in West China, and MM. Roborovsky and Kozloff in Tibet are the chief undertakings in Asia.

CORRESPONDENCE.

The Orthography of Geographical Names.

HAMBURG, May 27th, 1893.

In the May number of *The Geographical Journal* was published a very able review of my pamphlet on this subject, by Lieut.-Colonel J. C. Dalton. Though in most points the sense of my proposals has been rendered very accurately, there are some misunderstandings which appear grave enough to render a few corrections necessary.

Page 432, Principle B., *read*, instead of "disregarding," "preserving."

Page 433, line 12 from below, *omit* "or aspirated."

Ibid. Rule 5, *read*, "all that bears on traditional orthography must be given with large initials, the phonetic rendering with small ones. Thus, for example, Kiyef (*Kiew*), Futschau (*Foochow*), where the word in brackets shows the traditional

orthography, and Kew (*kyu*), Chiety (*kiéti*), Ceuta (*thé-uta*), where it gives the pronunciation."

Page 434, Rule 7, C., *read*, "when their casual omission will not render the pronunciation unrecognisable, but only less exact." The reason of this proposal is, that we must expect an omission of these signs in publications of less scientific character, such as newspapers, etc.

Page 435, Rule 10, *read* "indispensable only"; and for "would be used," *read* "might be omitted."

Ibid. Rule 12, for "speaking generally," *read* "whenever transcription is aimed at" (*viz.*, in cases not reserved for the historical orthography by Rule 1).

I am far from being an authority in phonetics. My object was simply to assist in the general introduction of the system of the Royal Geographical Society and others derived from it afterwards, by a modest re-adjustment of it on the basis of the doctrine of sounds. Surely phoneticists like Mr. Sweet and Miss Soames and others will judge my system a very crude and purely practical one, and such it must be for the given purpose. It suffices, if it is not a false one. It does not differentiate any sound, or group of sounds, which is not already clearly indicated on most of the existing European charts for *some part* of the world, only it aims to make such designations general for *all parts, as far as there exists no well-established historical orthography in Roman letters*. In view of the innumerable existing systems of transcription it takes the rules of the Royal Geographical Society as a firm basis, and the improvements, which it proposes on these, are relatively few and far from being complicated and ideal. In quoting geographical names from Western Europe, I do not propose any change in their historical spelling, but only, for school-books, etc., the addition of their pronunciation (in brackets, with small initials), and the adoption, for *this purpose*, of the *same* system, which will be adopted for the writing of African, etc., names. It is clear that this would facilitate the introduction of a more correct pronunciation of geographic names in schools, and among the educated public in general.

DR. W. KÖPPEN.

The Editor of *The Geographical Journal*.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Special General Meeting, April 24th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., F.R.S., President, in the Chair.

THE Meeting was summoned by the Council by the following notice, which was sent to all Fellows in Great Britain :—

The Council give notice that a Special General Meeting will be held at 5 P.M. [subsequently altered to 4.30 P.M.] on April 24th next, in the Hall of the University of London, Burlington Gardens, W. (by permission of the Senate), the Right Hon. Sir Mountstuart E. Grant Duff, G.C.S.I., F.R.S., &c., President, in the Chair, to consider the following proposal, which has been made by Admiral Sir E. Inglefield and five other Fellows, in accordance with Chapter V., Section 2 of the Regulations :—

"That the following new Regulations be added to the existing Regulations of the Society, namely, Chapter II., Para. 5A. :—'Ladies may be elected as

Ordinary Fellows, but shall not be eligible to serve on the Council or in any of the Offices of the Society.'

"Chapter VII., Interpretation Clause:—'Wherever required in these Regulations or the Appendix thereto, words importing the masculine gender only shall include the feminine gender.'"

(Signed)

D. W. FRESHFIELD.

H. SEEBOHM.

The first new Regulation was moved by Admiral Sir E. Inglefield, and seconded by General Sir Owen T. Burne.

The following amendment was proposed by Lord Aberdare, and seconded by General R. Strachey:—

"That all the words in the Resolution just moved after 'Fellows' be left out."

This was negatived by 147 to 105.

Admiral Sir E. Inglefield then withdrew both the Resolutions of which he had given notice.

An amendment to the original Resolution was moved by Admiral J. Halliday Cave to the following effect:—

"1st. Ladies may be elected as Honorary Fellows of the Society;

"2nd. That the number of the Honorary Fellows may be increased from forty (the present restricted number) to one hundred."

This was seconded by Mr. William Coward, but was withdrawn.

The President thereupon stated to the Meeting that, in view of the result of the vote that had been taken, he should think it his duty to advise the Council to refrain from the further election of ladies.

The Anniversary Meeting, May 29th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., F.R.S., President, in the Chair.

At the commencement of the proceedings, the Honorary Secretary (Mr. DOUGLAS W. FRESHFIELD) read the rules which govern the business of the Anniversary Meetings; the minutes of the last Anniversary Meeting, May 23rd, 1892, those of the Special General Meetings of November 28th, 1892, and April 24th, 1893.

The President next appointed Mr. J. S. DYASON and Mr. R. A. McLEAN scrutineers for the ballot about to take place.

The Annual Report of the Council was then presented and taken as read.

REPORT OF THE COUNCIL.

The Council have the pleasure of submitting to the Fellows the following Report on the general and financial condition of the Society:—

Membership.—The question of electing ladies as Ordinary Fellows was considered by a Special General Meeting on April 24th, when it was decided in the negative by a considerable majority. The Council regard this vote (unless hereafter rescinded by a General Meeting) as conclusive against any further election of ladies as Ordinary Fellows, without prejudice to the *status* of those already elected. They consider that, under the circumstances, all the legal expenses incurred in connection with this important question may equitably be defrayed by the Society, and they have accordingly provided for their being so defrayed.

The number of Fellows elected during the year ending April 30th, 1893, was 326, not including 22 ladies, and three Honorary Corresponding Members. In the previous year, 1891-92, the total elections amounted to 193, and in 1890-91 the number was 237. Our losses have been, by death 80 (besides 2 Honorary Corres-

ponding Members), by resignation 44, and by removal on account of arrears of subscription 58; making an increase for the year of 144 male Fellows besides 22 ladies. In the year 1891-92 there was a decrease of 23; in 1890-91 an increase of 84. The total number of Fellows on the list (exclusive of Honorary Members, but including ladies) on May 1st was 3691. There has been no such increase since 1875, when the net additions reached 202.

Finance.—As will be seen by the annexed Balance Sheet, the total net income for the Financial year ending December 31st, 1892 (*i.e.* exclusive of balance in hand) was 9299*l.* 18*s.* 7*d.*, of which 7007*l.* consisted of entrance-fees and subscriptions of Fellows. In the previous year, 1891, the total net income was 8322*l.* 16*s.* 8*d.*, and the amount of subscriptions, &c., 6067*l.*; in 1890 the two totals were 9531*l.* 16*s.* 2*d.*, and 7053*l.* respectively.

The net expenditure for the past year (*i.e.* exclusive of balance in hand) was 9012*l.* 7*s.* 5½*d.* The net expenditure in 1891 was 8171*l.* 3*s.* 9*d.*; in 1890, 8218*l.* 5*s.* 10*d.*

The Finance Committee of the Council have held, as usual, Meetings during the year, supervising the accounts of the Society. The Annual Audit was held on April 14th last, the Auditors being, on behalf of the Council, Sir Rawson W. Rawson and S. W. Silver, Esq., and on behalf of the Fellows at large, E. O. Tudor, Esq., and J. Duncan Thomson, Esq. The cordial thanks of the Council and Fellows are due to these gentlemen for having freely devoted their valuable time to this important task. At the end of their labours the Auditors drew up the following Report to the Council:—

Auditors' Report.—"The Auditors appointed for the examination of the Accounts of the Royal Geographical Society for the year ended December 31st, 1892, have examined the Balance Sheet submitted to them, and having compared it with the books and vouchers, have found it correctly stated and sufficiently vouched. The Accountant has kept and rendered the same in the usual commendable manner.

"The financial results of the year are in every respect satisfactory and encouraging. The receipts (9300*l.*) have almost equalled those of 1890 (9532*l.*), which were exceptionally swollen by the public reception of Mr. H. M. Stanley on his return from Africa, and they have exceeded either of the years 1889 or 1891 by 1076*l.* The expenditure (9012*l.*) exceeds that of 1891 by 841*l.*, leaving a balance on December 31st of 558*l.*, which is more than double that of 1891.

"The excess in the expenditure is distributed over the general expenses of the Establishment (257*l.*), and the meetings, 500*l.* The latter is accounted for by the revival of the Annual Dinner, and the *Conversazione* at South Kensington, and by the new arrangements for the reception of Fellows after the Ordinary Evening Meetings.

"There appears to be no reason to doubt that, looking to the changes recently made in the charge for Entrance Fees and Life Compositions, such an increase of expenditure as that of last year will in future be fully met.

"For the purpose of future comparison with the cost of Publications under the recent change in their form it may be useful to record the cost thereof and the proceeds of sales and advertisements during the last three years, and it will be satisfactory to show that in the year 1892 the increase in the sales and advertisements has much more than covered the small increase in the cost of production and circulation.

	Cost. £	Proceeds of sales and advertisements. £	Increase of	
			Cost. £	Sale. £
1890	2753	557	—	—
1891	2818	584	65	27
1892	2846	663	28	79

"The arrears of Subscription, valued last year at 467*l.*, have increased this year to 558*l.*

"The Investments remain unchanged. The details follow:—

SOURCE.							£	s.	d.
Davis bequest	..	..	..	..	..	..	1800	0	0
Murchison bequest	..	..	..	..	..	..	1000	0	0
Gill Memorial	..	..	..	..	..	..	1028	5	6
Peek Grant	..	..	..	..	..	..	1000	0	0
Back bequest	..	..	..	..	..	..	561	0	8
Trevelyan bequest	..	..	..	..	..	..	510	4	0
Miscellaneous	..	..	..	..	..	..	15,519	2	2
							£21,418	12	4

NATURE.							£	s.	d.
North-Eastern Railway 4 per Cent. Debenture Stock	..						1000	0	0
Great Indian Peninsular Railway 5 per Cent. Stock	..						4830	0	0
Great Western Railway 4½ per Cent. Stock (Davis bequest)							1800	0	0
London and North-Western Railway 4 per Cent. Stock (Murchison bequest)	..	..	..	..	..	..	1000	0	0
Caledonian Railway 4 per Cent. Preference Stock	..						2000	0	0
New Zealand 4 per Cent. Stock	..	..	..	..	..	..	1000	0	0
Norwegian 4 per Cent. Bonds	..	..	..	..	..	..	1000	0	0
New South Wales 3½ per Cent. Stock (Gill Memorial)	..						1028	5	6
India Stock	..	..	..	..	..	..	1000	0	0
India 3½ per Cent. Debentures	..	..	..	..	..	..	1000	0	0
Consols	..	..	..	..	..	..	3669	2	2
„ (Peek fund)	..	..	..	..	..	..	1000	0	0
„ (Back bequest)	..	..	..	..	..	..	561	0	8
„ (Trevelyan bequest)	..	..	..	..	..	..	510	4	0
							£21,418	12	4

"The present value of the above Stock was estimated in March last at 27,069*l.* 12*s.* 3*d.*, showing an increased value of 533*l.* 3*s.* 7*d.*, without any change in the nominal amount.

"RAWSON W. RAWSON,
 "S. W. SILVER,
 "J. D. THOMSON,
 "E. O. TUDOR,

Auditors.

"April 14*th*, 1893."

A statement has been submitted by Sir Rawson W. Rawson, showing the proportion of Life Compositions to Annual Subscriptions in each of the last twenty-one years, with a result that the amount invested has exceeded the amount which should properly have been set aside during that period in respect of Life Compositions.

The following Balance Sheet and Statement, showing the Receipts and Expenditure of the Society from the year 1848 up to the present date, are annexed to the Report of the Auditors:—

Receipts.

BALANCE SHEET FOR THE YEAR 1892.

Expenditure.

1892.	£	s.	d.	£	s.	d.	1892.	£	s.	d.	£	s.	d.	
Balance in Bankers' hands Dec. 31st, 1891.	260	8	4				House:—							
Do. Accountant's do.	10	2	10½	270	11	2½	Taxes and Insurance..	98	18	0				
							Repairs and Furniture	154	7	11				
							Coals, Gas, and Water	81	10	2				
							Miscellaneous ..	164	7	2				
Subscriptions:—							Office:—				499	3	3	
Arrears..	280	0	0				Salaries and Gratuity..	1010	13	4				
For the current year ..	4052	0	0				Stationery and Printing	387	14	3				
Paid in advance ..	776	0	0				Miscellaneous ..	275	16	1				
				5108	0	0	Library:—				1674	3	8	
Entrance Fees ..				747	0	0	Salaries..	292	10	0				
Life Compositions ..				1152	0	0	Purchase of Books ..	94	19	7				
Parliamentary Grant ..				500	0	0	Binding ..	108	16	3				
Royal Premium ..				62	10	0	Miscellaneous ..	131	2	6				
Rent of Shop ..				43	0	0	Map-Room:—				627	8	3	
							Salaries ..	450	0	0				
Publications:—							Purchase of Maps and Diagrams ..	29	11	8				
Sale of Publications ..	474	9	5				Instruments and Repairs ..	227	13	0				
Advertisements in 'Proceedings'	189	10	0				Miscellaneous ..	147	10	0				
				663	19	5	Map-Drawing-room:—				854	14	8	
Payments for Scientific Instruction ..				41	7	6	Salaries ..	350	0	0				
Payments made in error, &c.				63	17	7	Miscellaneous ..	15	4	0				
Loan of Diagrams and Slides ..				9	1	0	Meetings:—				365	4	0	
Sale of Souree Tickets ..				25	5	0	Evening Meetings ..	327	17	6				
							Anniversary Dinner ..	58	10	0				
							Souree at South Kensington ..	290	8	0				
							Miscellaneous ..	114	5	4				
Dividends:—											791	1	1	
North-Eastern Railway 4 per Cent. Debenture Stock .. 1000l.	39	0	0				Medals and other awards				283	6	6	
Great Indian Peninsula Railway 5 per Cent. Stock .. 4850l.	322	14	8				Scientific Purposes and Education:—							
Great Western Railway 4½ per Cent. Stock [Davis bequest] 1800l.	74	11	9				Scientific Instruction..	63	5	0				
London and North-Western Railway 4 per Cent. Stock [Murchison bequest] 1000l.	39	0	0				Oxford University (Readership) ..	150	0	0				
Caledonian Railway 4 per Cent. Preference Stock .. 2000l.	78	0	0				Oxford University (Studentship) ..	75	0	0				
Norwegian 4 per Cent. Bonds .. 1000l.	39	0	0				Owens College (Council Grant) ..	50	0	0				
New Zealand 4 per Cent. Stock .. 1000l.	39	0	0				Houssa Association ..	30	0	0				
New South Wales 3½ per Cent. Stock [Gill memorial] 1028l. 5s. 6d.	35	1	10				Publications:—				373	5	0	
India Stock .. 1000l.	31	13	8				Printing Monthly 'Proceedings' ..	1138	1	0½				
India 3½ per Cent. Debentures .. 1000l.	34	2	8				Printing 'Supplementary Papers' Vol. III., Part 2 ..	86	17	2				
Consols 3669l. 2s. 2d.	98	7	8				Maps and Illustrations for 'Proceedings' ..	817	3	7				
" [Peek fund] 1000l.	26	16	4				Postage of Monthly 'Proceedings' ..	312	0	5½				
[Back bequest] 661l. 0s. 8d.	15	1	0				Payments to Contributors, Translations, &c.	204	0	0				
" [Trevelyan bequest] 510l. 4s. 0d.	13	13	4				Editor of Publications ..	200	0	0				
Interest on 1000l. deposited to Oct. 4th, 1892 ..	7	15	2				Miscellaneous ..	88	0	3½				
				893	19	1					2846	2	6½	
							Payments in error returned				43	8	6	
							Grant towards International Geographical Congress ..				100	0	0	
							Expeditions and aid to Travellers:—							
							Grant to Mr. A. E. Pratt ..	100	0	0				
							Grant towards Dr. Nansen's Polar Expedition ..	300	0	0				
							Grant towards Antarctic Whaling Expedition (Instruments) ..	154	10	0				
											554	10	0	
							Balance in Bankers' hands Dec. 31st, 1892	546	19	2				
							Do. Accountant's do.	11	3	2				
											559	2	4	
											£	9570	9	9½

E. L. S. COCKS,
Treasurer.

Audited and found correct, April 14th, 1893.

RAWSON W. RAWSON,
S. W. SILVER,
J. D. THOMSON,
E. O. TUDOR,

Auditors.

STATEMENT showing the RECEIPTS and EXPENDITURE of the Society from the Year 1848 to Dec. 31st, 1892.

	Year.	Cash Receipts within the Year.	Cash Amounts invested in Funds	Deducting Amounts invested in Funds; actual Expenditure.
		£ s. d.	£ s. d.	£ s. d.
¹ Includes Treasury Grant of 1000 <i>l.</i> for the East African Expedition.	1848	696 10 5	.. ..	755 6 1
	1849	718 3 0	.. ..	1,098 7 6
² Includes Treasury Grant of 2500 <i>l.</i> for the East African Expedition.	1850	1,036 10 5	.. ..	877 2 10
	1851	1,056 11 8	.. ..	908 14 7
³ Includes Legacy of Mr. Benjamin Oliveira, 150 <i>l.</i> 17 <i>s.</i> 1 <i>d.</i>	1852	1,220 3 4	.. ..	995 13 1
	1853	1,917 2 6	.. ..	1,675 6 0
	1854	2,565 7 8	.. ..	2,197 19 3
⁴ Includes Legacy of Mr. Alfred Davis, 1800 <i>l.</i>	1855	2,584 7 0	.. ..	2,636 3 1
	1856	3,372 5 1	533 10 0	2,814 8 1
	1857	3,142 13 4	378 0 0	3,480 19 9
⁵ Includes Legacy of Sir Roderick Murchison, 1000 <i>l.</i>	1858	3,089 16 1	.. ..	2,944 13 6
	1859	3,471 11 8	950 0 0	3,423 3 9
⁶ Includes Mr. James Young's Grant for Congo Expedition, 2000 <i>l.</i>	1860	8,449 12 1	466 17 6	5,406 3 7
	1861	4,792 12 9	1,358 2 6	3,074 7 4
	1862	4,659 7 9	1,389 7 6	3,095 19 4
⁷ Includes 1000 <i>l.</i> 14 <i>s.</i> 6 <i>d.</i> sale of Exchangeur Bills.	1863	6,256 9 3	1,837 10 0	3,655 4 0
	1864	4,977 8 6	1,796 5 0	3,647 7 10
⁸ Includes Mr. James Young's Grant for the Congo Expedition, 1011 <i>l.</i> 14 <i>s.</i>	1865	4,905 8 3	1,041 5 0	4,307 4 5
	1866	6,085 8 3	1,028 15 0	4,052 15 0
	1867	5,462 7 11	1,029 0 6	3,943 17 4
	1868	5,991 4 0	1,857 3 9	4,158 17 10
⁹ Includes Parliamentary Grant of 3000 <i>l.</i> to Cameron Expedition.	1869	8,859 16 0	2,131 5 0	4,646 0 8
	1870	8,042 6 1	3,802 6 0	3,245 10 6
¹⁰ Includes Donation of 500 <i>l.</i> by Mr. C. J. Lambert.	1871	8,637 3 7	1,000 0 0	3,726 4 4
	1872	8,119 7 9	1,999 4 6	5,871 13 2
	1873	7,761 18 10	2,015 1 8	6,697 12 6
¹¹ Includes Legacy of Admiral Sir George Back, 540 <i>l.</i>	1874	8,753 5 10	499 0 0	7,576 2 3
	1875	7,934 15 10	2,002 7 6	5,883 4 10
	1876	11,611 11 8	.. ..	6,870 13 1
¹² Includes Legacy of Sir W. C. Trevelyan, 500 <i>l.</i>	1877	107,950 1 11	2,533 2 0	8,940 17 11*
	1878	118,124 10 0	3,000 0 0	6,361 9 6
¹³ Includes 1005 <i>l.</i> 8 <i>s.</i> 2 <i>d.</i> , sale of Exchangeur Bills.	1879	128,979 14 10	1,551 10 10	6,990 14 2
	1880	8,599 18 4	1,567 5 1	8,454 1 10†
¹⁴ Includes 1000 <i>l.</i> received from Mr. B. Leigh Smith.	1881	8,809 19 5	.. ..	8,362 5 6‡
	1882	138,942 15 0	.. ..	8,779 10 7
	1883	149,599 9 0	1,001 5 0	8,624 2 11
¹⁵ Includes 500 <i>l.</i> on loan from Bankers.	1884	168,964 11 7‡	.. ..	9,266 0 5
	1885	168,738 12 3	.. ..	8,555 3 10‡
¹⁶ Includes 998 <i>l.</i> 0 <i>s.</i> 10 <i>d.</i> , sale of India Debentures.	1886	177,968 9 0	1,000 0 0	7,767 18 0‡
	1887	8,007 16 3	.. ..	8,493 10 3
¹⁷ Includes Donation of 1000 <i>l.</i> from Miss Gill.	1888	8,053 5 0	.. ..	7,903 18 6
	1889	8,224 7 7	1,000 0 0	7,025 15 10
	1890	9,531 16 2	850 0 0	8,219 5 10
	1891	8,322 16 8	1,000 0 0	8,171 3 9
	1892	9,299 18 7	.. ..	9,012 7 5‡

* This sum includes the Special Parliamentary Grant transferred to the Cameron Expedition Fund in February 1877.

† This amount includes the payment of two sums of 500*l.* each, contributed to the African Exploration Fund in this and the previous year.

‡ This sum includes the payment of 102*l.* 8*s.* to the African Exploration Fund; also 714*l.* 9*s.* 1*d.*, the final payment for Cameron Expedition Fund.

STATEMENT OF ASSETS—December 31st, 1892.

	£ s. d.
Freehold House, Fittings, and Furniture, estimated (exclusive of Map Collections and Library insured for 10,000 <i>l.</i>)	20,000 0 0
Investments (amounts of Stock), as detailed in the above Report of the Auditors valued April last at	27,069 12 3
Arrears due on December 31st, 1892, £1395. Estimated at	558 0 0
Balance at Bank	£546 19 2
„ in Accountant's hands	11 3 2
	558 2 4
Total	£48,185 14 7

Publications.—The monthly *Proceedings* have been issued with regularity throughout the year; the twelve numbers for 1892 forming a volume of 926 pages, illustrated by 30 maps and 16 illustrations. The total cost of the edition of 5000 copies (including 312*l.* 0*s.* 5½*d.* for free delivery to Fellows and Institutions) was 275*9*l.** 5*s.* 4½*d.* From this is to be deducted the amount of 663*l.* 19*s.* 5*d.* received from sale of copies to the public and from advertisements. The sum of 86*l.* 17*s.* 2*d.* was expended on 'Supplementary Papers.'

Library.—During the past year 706 books and pamphlets, in addition to serial publications, have been added to the Library; 541 by donation, and 165 by purchase; 300 pamphlets have been put in covers by the Society's map-mounter, and 256 volumes have been bound.

The sum of 141*l.* 14*s.* 3*d.* has been spent in purchasing books, and the further sum of 74*l.* 6*s.* in binding for the Library.

Library Catalogue.—The third supplement to the Authors' Catalogue, containing the titles of all works added to the Library in the years 1881-1890, has been completed, and is ready for printing, and a comprehensive Subject Catalogue is in active preparation. All accessions to the Library are now indexed in the *Geographical Journal* in such a manner as to present monthly a classified record of the most recent literature in all departments of geographical science.

Scientific Purposes Grant.—During the past year 24 intending travellers have received instruction from Mr. Coles in Practical Astronomy, in the Society's Observatory, and in route surveying with the theodolite, prismatic compass, and plane-table, in the country, and 220 hours have been devoted to teaching.

Instruments to the value of 475*l.* 1*s.* 6*d.* have been lent during the past year to the following travellers:—Captain F. R. Maunsell, R.A. (Euphrates Valley, Persia, &c.), 64*l.* 8*s.* 6*d.*; Mr. G. B. Grundy (Bœotia), 18*l.* 18*s.*; Mr. St. G. R. Littledale (Central Asia), 18*l.* 15*s.*; Mr. C. W. Campbell (Korea), 78*l.*; Lieutenant Coningham (Persia), 17*l.* 15*s.*; Captain H. W. Dowding, R.N. (Upper Amazons), 69*l.* 7*s.* 6*d.*; Sir Wm. Macgregor (New Guinea) 87*l.* 13*s.* 6*d.*; Captain H. Picot (I.S.C.) (Central Asia), 10*l.* 10*s.*; Mr. J. C. White (Sikkim), 44*l.*; Mr. Robert M. W. Swan (South-East Africa), 65*l.* 14*s.* In addition to these, a special grant of instruments to the value of 154*l.* 10*s.* was made to the Antarctic Whaling Expedition, 1892.

The instruments lent to the following gentlemen have been returned during the past year, with the exception of those which have been lost:—Mr. F. S. Arnot (Central Africa), 1889; Mr. H. Ridley (Malay Peninsula), 1890; Mr. J. W. Wells (Haiti, West Indies), 1892; Mr. G. B. Grundy (Bœotia), 1892; Mr. A. E. Pratt (South America), 1892; Captain F. R. Maunsell, R.A. (Euphrates Valley, Persia, &c.), 1892; Mr. F. C. Selous (South Central Africa), 1888; Mr. W. M. Conway (Himalayas), 1892.

The following is a list of travellers who still have instruments lent to them in their possession:—Rev. T. Wakefield (East Africa), 1882-83; Mr. W. Deans Cowan (Madagascar), 1883; Mr. E. Douglas Archibald (for cloud observations in England), 1885; Dr. E. J. Baxter (East Africa), 1885; Mr. H. H. Johnston (South-East Africa), 1889; Rev. A. Hetherwick (South-East Africa), 1891; Lieut. B. L. Sclater, R.E. (Mr. H. H. Johnston's Expedition, South-East Africa), 1891; Sir C. M. Macdonald (Niger Region), 1891; Mr. St. G. R. Littledale (Central Asia) 1893; Mr. C. W. Campbell (Korea), 1893; Lieut. Coningham (Persia), 1893; Captain H. W. Dowding, R.N. (Upper Amazons), 1893; Sir Wm. Macgregor (New Guinea), 1893; Captain H. Picot, I.S.C. (Central Asia), 1893; Mr. J. C. White (Sikkim), 1893; Mr. Robert M. W. Swan (South-East Africa), 1893.

Exhibitions in the Map Room.—During the season a series of exhibitions of

photographs, weapons, implements, &c., in connection with papers read before the Society, have been held in the Map Room for several days after each Meeting.

Map Room.—The accessions to the Map Room Collection during the past year comprise 882 Maps and Charts on 1456 sheets; 53 Atlases (including continuations) containing 730 sheets of Maps, 997 Photographs, 354 Lantern Slides. Of these, 42 Maps on 140 sheets, 18 Atlases, 168 Photographs, and 339 Lantern Slides have been purchased. The accessions exceed those of the previous year by 8 Maps, 19 Atlases, 16 Photographs, and 111 Lantern Slides.

The adoption of the Report was moved by General R. STRACHEY and seconded by GENERAL J. T. WALKER.

The rejection of the report was moved by Mr. DIBDIN and seconded by Colonel HORACE MONTAGU. On a vote being taken, it was found that 237 were in favour of the adoption of the report and 144 for its rejection. The report was therefore adopted.

PRESENTATION OF THE ROYAL MEDALS.

The Royal Medals for the Encouragement of Geographical Science and Discovery had been awarded by the Council as follows:—

The Founders' Medal to Mr. FREDERICK COURTNEY SELOUS, in recognition of his twenty years' exploration and surveys in South Africa.

The Patron's Medal to Mr. W. WOODVILLE ROCKHILL, for his travels and explorations in Western China, Koko-nor, Tsaidam, and Tibet, and his observations in the ethnology and languages of the countries visited, published in his work 'The Land of the Lamas,' for the enterprise and intrepidity shown by him, and for his years of study of the native languages to prepare him for these travels.

In presenting the Founders' Medal to Mr. Selous, the PRESIDENT addressed him as follows:—

"Mr. Selous, I have already had the pleasure elsewhere of hailing you as our Medallist-designate, and I now place in your hands the Founders' Medal. You have won it by twenty years of pioneering in a country which was, when you entered it, almost absolutely unknown to Europeans, by a careful study of that country, a study which became always more fruitful as you increased in years and in knowledge, by frequent and generous communication of what you had learnt to this Society, and through it to the whole world, by great services to the empire and to civilisation. We all trust that your contributions to the advancement of science are very far indeed from being ended, and that you will gain fresh laurels in the land where you have already gained so many."

Mr. SELOUS said: Mr. President, Ladies and Gentlemen,—Many years ago I went out to South Africa with the settled determination of making my way into unexplored regions, and I very soon penetrated into little known if not quite unknown parts of the country. At that time I knew absolutely nothing about the Royal Geographical Society; but I very soon made up my mind that to gain as much knowledge as possible concerning the countries in which I was travelling, and to put my notes on record, was a duty which I owed to the country in which I had been born; and I therefore, at a very early period of my wanderings, commenced to make rough sketch-maps of the countries in which I travelled. In 1878 I was fortunate enough to meet with Sir Bartle Frere, on the occasion of his first visit to the Transvaal, and, acting upon his advice, I sent my first maps to the Royal Geographical Society. Since that time I have never ceased to record my routes wherever I have travelled, and I have always sent my work to the Royal Geographical Society. This rough work of an unscientific explorer has always met

with most generous recognition at the hands of this Society. In 1884 I was awarded the Cuthbert Peek Grant, and five years later I was given the Back Premium. Since that time I have spent four more years in Mashonaland and adjacent territories, and during that time I have been enabled to make a careful compass survey of the greater portion of that country; and that the work that I have done has been considered of sufficient value and interest by the President and Council of the Royal Geographical Society to justify them in awarding to me the Founders' Medal for this year has been a source of the most profound satisfaction to me, and I beg to assure you of my very high appreciation of the great honour which has been done to me. This honour is the fulfilment of one of the highest ambitions of my life, and I think I can say that it will give much pleasure to my many friends and well-wishers in far-off Mashonaland. That country now affords a splendid base from which to start upon exploring expeditions into the yet unknown country beyond the Zambesi, and I hope that the knowledge that the Founders' Medal this year has been awarded to myself—I who am so well known in that country, more known perhaps as a hunter and a naturalist there than an explorer—may stimulate many young men in that land to emulate my example, to make sketch-maps of whatever unknown countries they happen to wander into, whether as hunters or as prospectors, and to send the results of their work to a Society which has always shown itself to be so generously appreciative of honest endeavour as has been the Royal Geographical Society. Let me once more assure you of my most high and sincere appreciation of the great honour that has been conferred upon me this day.

In presenting the Patron's Medal to Mr. Henry White, the Acting Minister of the United States, for transmission to Mr. Rockhill, the PRESIDENT said:—Your Excellency,—I have to thank you very warmly in the name of the Royal Geographical Society for honouring our gathering on this occasion as the representative of a great and kindred nation. Had Mr. Rockhill been able to be present in person, it would not have been necessary for me to have taxed your kindness; but he is in America, and I am obliged to ask you to transmit to him our Patron's Medal, with the congratulations of this Society. He has gained it by two long and most arduous journeys in Tibet, one of the least inviting of countries, but one which will present constant temptations to the adventurous traveller till it has given up the last of its secrets.

Mr. Rockhill has not only proved himself an excellent explorer, but, during his residence as a diplomatist in the far East, has earned a reputation as a successful student of Oriental languages. He was good enough to cross the Atlantic recently for the purpose of reading us a paper, and I hope that, if he returns, as seems not improbable, to the regions where he has already done such excellent service to our science, we may frequently hear from him, and receive further enlightenment from the ever-increasing stores of his observation and learning.

Mr. WHITE replied: Mr. President, Ladies and Gentlemen,—I need scarcely say that it has given me the greatest pleasure to respond to your kind invitation, and to attend here to-day to receive this Medal on behalf of my friend and countryman, Mr. Rockhill, to hear the very kind words which you have spoken in reference to him, and the applause with which those remarks have been greeted. I shall not fail to transmit to him every word that you have been kind enough to say, and to report to him the manner in which your remarks have been received. I must also express the great regret which I am sure Mr. Rockhill feels at his inability to be present here to-day; but, after having been for many years an ornament to the service to which I have the honour to belong, he was recently appointed chief clerk of the Department of State at Washington, and it has not been possible for him to leave his duties there in order to visit London for the purpose of receiving the Queen's Gold

Medal which this Society has conferred upon him. I have the honour, therefore, in Mr. Rockhill's absence to express his sincere thanks for the distinction which has been conferred upon him, and to assure you that it will be as highly appreciated by our countrymen as it is by him and by myself.

OTHER AWARDS.

The PRESIDENT then announced that the Council had awarded the Murchison and other premia as follows :—

The MURCHISON GRANT for 1893, to Mr. R. W. SENIOR, who for several years in succession, has carried out a most laborious duty in the higher ranges of Kulu and Lahaul, Punjab Himalayas, and the results achieved in point of accuracy, expedition, and amount of work done, have been exceptional in the face of great hardships and great physical difficulties.

The GILL MEMORIAL, to Mr. HENRY O. FORBES, for his Explorations and Natural History Observations in New Guinea, the Malay Archipelago, and the Chatham Islands.

The CUTHBERT PEEK GRANT, to Mr. CHARLES HOSE, for Explorations and Natural History Observations and Collections in Sarawak, Northern Borneo.

PRESENTATION OF THE TRAINING COLLEGE PRIZES.

The Prizes offered by the Society to the students of English Training Colleges, for proficiency in geography at the examinations in December last, had been awarded by the examiners in the Education Department as follows :—

MALE STUDENTS—*Prizes*—(£5 each):—A. J. Catt, Borough Road Training College; R. W. Guppy, Exeter Training College; J. V. Semmens, Westminster Training College; *Book Prizes*:—E. O. Cole, Exeter Training College; F. W. Millson, Borough Road Training College; W. H. Mizen, Borough Road Training College; E. A. Turner, Battersea Training College. FEMALE STUDENTS—*Prizes*—(£5 each):—S. A. Crebbin, Whitelands Training College; L. S. Smith, Tottenham Training College; E. M. Williams, Stockwell Training College; *Book Prizes*:—A. Baker, Ripon Training College; E. Hamlyn, Tottenham Training College; A. Nixon, Stockwell Training College; A. Pilling, Stockwell Training College.*

Mr. H. J. MACKINDER, in introducing the successful students, made the following remarks :—

It has become customary of late years, that before introducing the students, I should say just a few words on the present state of geographical instruction and the educational work upon which the Society is engaged—so far as it comes within my cognisance. I have to say, with regard to this year, that it has been exceedingly

* The Medals, for the promotion of geographical education, placed by the Society at the disposal of the syndicates respectively of the Oxford and Cambridge Local Examinations, were awarded as follows :—

1892. Oxford (June).—*Silver Medal*—A. R. Belcher, Maidstone. *Bronze Medal*—D. T. Chadwick, Lincoln.

Cambridge (December).—*Silver Medal* (Physical Geography)—Annie Elizabeth Knight, Eastbourne. *Silver Medal* (Political Geography)—John Graham Bell, Blackheath.

The Prize Atlases offered by the Society for geographical proficiency to the cadets of the Nautical Training Colleges, on board H.M. ships *Worcester* and *Conway*, were awarded, at the examination held in July, 1892, to the following :—H. Y. Berg (*Worcester* training ship); A. C. T. A. Miller (*Conway* training ship).

No. I.—JULY, 1893.]

fruitful, and that so far as Oxford is concerned—of which, of course, alone, I can claim to have an intimate knowledge—I think, as I have said in the report to the Council, there is what we have not been able to speak of, I think before now, a certain definite drift of thought in several subjects studied in the Universities, towards the geographical side of those subjects. It is so, most certainly, on the modern history side, and it is also, and I speak from many little evidences, the same in the literary school; therefore, I think it may be said, that the efforts of the Society are succeeding. As regards the attendance of students, I think I am able to say that it is the largest that we have yet had. We have had during the last winter sixty-one graduates and undergraduates from other colleges, and twenty-six lady students from three halls, in attendance. Though these attendances may not be very great, as contrasted with popular audiences, it is obvious that with a number such as that, a great amount of work can be got through in one subject. I may say that that is the more satisfactory, because we have ventured this winter to put a double amount of work upon each individual student. Then, I am happy further to be able to say what possibly may not be known, even to the Council as yet, that the Oxford travelling studentship, the geographical studentship, part of the funds of which is found by the Society, is likely this year to produce a rather remarkable result. You will remember that the electors appointed a gentleman, Mr. Cozens Hardy, who had already had some experience of the region to which he proposed to go—the frontiers of Montenegro and Albania—of which, curiously enough, less is accurately known than now, I think we may say, of many parts of Africa. The expenditure of the Society has had the effect of bringing considerable additional expenditure from other sources. In all probability, I hear that it is likely that Mr. Hardy will be accompanied or followed by two, three, or four, able students from Oxford. All the members of the expedition are now studying present geography and past geography, and one or two are also studying the archaeological side of the district. The district is one of great importance, and there are many points in its ancient geography quite unsettled. I have now to introduce to you the students of the training colleges, connected with our elementary educational system, who have gained the prizes of the Society. There is a little difference this year; you will notice that in the place of a single scholarship of £15 for each division, three prizes of £5 each are awarded to the students first on the list.

THE BALLOT FOR THE COUNCIL, 1893-94.

The President then read the report of the scrutineers on the result of the ballot for the new Council, which declared that the list as proposed by the Council had been elected.

The list is as follows, the names of new members, or those who change office, being printed in *italics*:—

President:—*Clements R. Markham, Esq., C.B., F.R.S. F.S.A.*; *Vice-Presidents*: *Hon. G. C. Brodrick*; Sir Joseph D. Hooker, K.C.S.I., C.B., F.R.S.; Sir John Kirk, K.C.B., G.C.M.G., F.R.S.; *W. T. Blanford, Esq., LL.D., F.R.S., F.G.S.*; General R. Strachey, R.E., C.S.I., F.R.S.; *Captain W. J. L. Wharton, R.N. F.R.S.*; *Treasurer*: Edward L. Somers Cocks, Esq. *Trustees*: (Right Hon. Lord Aberdare, G.C.B., F.R.S.; Right Hon. Sir John Lubbock, Bart., F.R.S., M.P.; *Secretaries*: Douglas W. Freshfield, Esq.; H. Seebohm, Esq., F.L.S. *Foreign Secretary*: General Sir C. P. Beauchamp Walker, K.C.B. *Members of Council*: *Admiral Lindesay Brine*; Hon. George N. Curzon, M.P.; Lieut.-Colonel James Cecil Dalton, R.A.; Major Leonard Darwin, R.E., M.P.; Francis Galton, Esq., F.R.S.; Sir George D. Taubman Guldie, K.C.M.G.; Major-General

Sir F. J. Goldsmid, K.C.S.I., C.B.; *General Sir T. E. Gordon*, C.B., K.C.S.I.; *Wilfred Hudleston*, Esq., F.R.S., F.G.S.; *General Sir W. Drummond Jervois*, G.C.M.G., C.B.; *J. K. Laughton*, Esq.; *George Sutherland Mackenzie*, Esq.; *E. Delmar Morgan*, Esq.; *John Murray*, Esq.; *Ernest G. Ravenstein*, Esq.; *Sir Rawson W. Rawson*, K.C.M.G., C.B.; *Howard Saunders*, Esq., F.L.S., F.Z.S.; *Colonel H. C. B. Tanner*; *General J. T. Walker*, R.E., C.B., F.R.S.; *Colonel C. M. Watson*, R.E., C.M.G.; *Colonel Sir Charles W. Wilson*, R.E., K.C.B., K.C.M.G., F.R.S.

The EARL OF MAYO rose and stated that he had a resolution to propose. The President said he could do so after the Annual Address had been read.

A Fellow asked if it were not necessary to give seven days' notice of any resolution to be proposed.

The PRESIDENT stated that that was so in the case of a Special General Meeting, but that such notice was not necessary at the Anniversary Meeting.

The PRESIDENT then proceeded to read his Annual Address, after which the Earl of Northbrook said:—As a past-president of the Royal Geographical Society, I am as well aware as any one that however interesting the work of the Society may be, the work devolving upon the President is most arduous and laborious. There are no scientific societies which involve greater attention to their business, on the part of the President, than does the work of the Royal Geographical Society, and I rise with great pleasure to move that the thanks of this meeting be given to the Right Hon. Sir Mountstuart Grant Duff, not only for the most interesting address which he has read to-day, but for the very valuable services which he has rendered to the Society as its President during the past four years. During these four years probably more interesting meetings of the Society have been held than at any previous time—at least there have been none more interesting. We have had most distinguished explorers from Africa, who have attracted a great part of public attention during that time. We have had Mr. Stanley, Captain Lugard, and now Mr. Selous, to whom the Society has to-day awarded the Founders' Medal. But in other parts of the Earth the progress of geographical discovery has been remarkable. We have had Captain Bower, Mr. Rockhill, Dr. Nansen, and Mr. Conway; and these distinguished travellers have given the opportunity to our President to deliver these interesting addresses, for which he is so peculiarly distinguished. Therefore, upon no occasion in my recollection should a vote of thanks be more heartily responded to than to that which I am about to move to our President. I do not wish to occupy your time at any length, as this is a long meeting, but I must say that it has been to me a great personal pleasure to have been accidentally present here to-day, and to have had the honour conferred upon me of being asked to move this vote of thanks, because I have enjoyed the friendship of your President for many years, and I have had many opportunities of appreciating his extraordinary knowledge confined not to a few parts of the world, and his many qualities, which have made him an admirable President of the Royal Geographical Society. I beg to move that the cordial thanks of this meeting be given to the Right Hon. Sir Mountstuart Grant Duff for the address he has read to-day, and for his eminent services during four years as President of the Royal Geographical Society.

Sir JOHN LUBBOCK, in seconding, said: The President in his address just now alluded to the progress and prosperity of the Royal Geographical Society. That, no doubt, is due to a variety of causes; but I think you will all agree with me that one of them, and that not the least, has been the great ability and energy which our President has shown in the chair. Under the circumstances, and particularly at this late hour of the afternoon, I think it would be a work of supererogation to enlarge upon the subject, in seconding this resolution, and as Lord Northbrook has so very ably and fully proposed it to you, and alluded to the

many reasons why we should vote for it, I will content myself with thus briefly seconding the resolution.

The resolution having been heartily carried,

The PRESIDENT said: I beg to return my most heartfelt thanks to all the members of this Society for the resolution which they have passed, and to Lord Northbrook and Sir John Lubbock for the extremely kind terms in which they have respectively proposed and seconded it. It will always be a matter of gratification to me that the four years in which I have held the office of your President have synchronised with a period of remarkable prosperity in the history of the Society. I trust that this period of increased prosperity is only commencing, and that although we have had of late some rather lively passages, that they will all very soon come to an end, and that the question now before us will be settled in the only possible way in which it can be settled when it has once been fairly opened.

The Earl of Mayo then moved "That the Council be requested to elect more ladies as Fellows."

This was seconded by Sir FREDERICK YOUNG.

Mr. WILLIAM HICKS moved the previous question.

Lord Mayo's motion was supported by Lord Northbrook, Sir John Lubbock, Sir William H. Flower, General Strachey, and others, who, however, urged Lord Mayo not to press his motion. Lord Mayo in the end withdrew his motion, on the understanding that on the requisition of himself and five other Fellows, it should be submitted to a Special General Meeting to be summoned as soon as practicable.

The meeting then adjourned.

Thirteenth Ordinary Meeting, June 5th, 1893.—General R. STRACHEY, R.E., C.S.I., F.R.S., Vice-President, in the Chair.

ELECTIONS.—Colonel Patrick Wilson Bannerman (*India Staff Corps*); Charles Raymond Beazley, M.A.; Frederick Gudgin; Surgeon-Captain James Sullivan Green (*Army Medical Staff*); James George Langham; T. Fawcett Macdonald, M.D.; Edward Harker V. Melvill; Thomas Owen; Captain H. Picot, I.S.C.

The Paper read was:—

"Stairs' Expedition to Katanga." By Dr. J. A. Moloney.

There was an exhibition of photographs and maps in the tea-room.

THE ANNIVERSARY DINNER.

The anniversary dinner of the Society was held on Saturday, May 13th, in the Whitehall Rooms, Hôtel Métropole, the Right Hon. Sir Mountstuart E. Grant Duff, President, in the chair. Among those present were the Swedish Minister, the Danish Minister, Lord Kelvin, Right Hon. James Bryce, M.P., the Comte de Franqueville, the Lord Mayor, Sir John Dorington, General Sir F. Grenfell, Sir F. Bramwell, Sir Charles Tupper, Sir R. Welby, Sir R. Herbert, Sir George F. Bowen, General Sir R. Meade, Sir Thomas Wade, Sir A. Geikie, Sir A. Moloney, Sir Arthur Hodgson, General R. Strachey, General J. T. Walker, Colonel J. C. Dalton, Mr. John Murray, Mr. H. M. Stanley, Mr. F. C. Selous, Captain Lugard, Mr. T. S. Osler, Mr. C. H. Pearson, Mr. W. T. Thiselton Dyer, Mr. J. G. Fitch, Dr. H. Craik, Mr. Douglas W. Freshfield, and Mr. H. Seeböhm.

After the usual loyal toasts, the PRESIDENT proposed "The Army, Navy, and

the Reserve Forces, and the Diplomatic and Consular Services," to which General Sir F. Grenfell and Mr. James Bryce, M.P., responded.

General Sir F. GRENFELL said he had always regretted that, in the various expeditions in which he had served, no members of any scientific society had been attached to the Army. In Egypt our Intelligence Department has endeavoured to obtain, as far as possible, accurate maps of the country, and when they were all put together they would form a most invaluable record of our occupation. He specially referred to Colonel Ardagh, R.E., who carried on the survey in Lower Egypt, and to Mr. Floyer, who had made an expedition into the Atbai and had written a most valuable report on the country between the Nile and the Red Sea.

Mr. BRYCE said it was a happy and suitable thought to couple the Diplomatic and Consular service, as being equally non-political and equally an object of common pride to us with the other two services. His own connexion with these services lasted only six months, but it had been more than long enough to enable him to discover how large a quantity of energy, high ability, and public spirit we possessed in the men who represented Great Britain abroad. The old idea of a diplomatist was that he spent his time in the ball-rooms of Continental Governments, the elder men in playing whist and the younger men in dancing. But now the work of diplomatists and of consuls was anything but easy, although at the same time the old notion still lingered in some quarters, for he had heard it expressed in a place which was not only the prolific workshop of legislative novelties, but also the refuge of obsolete superstitions—he meant the House of Commons. Our representatives abroad were now really hard-worked men, and they had to present elaborate and enormous reports on all sorts of subjects, including the manners which occasionally made English tourists unpopular abroad. These reports were of very great permanent value, and he believed their value would be more fully recognised if they were not published by the Government, for as soon as they were issued from the Queen's printers they were considered proper matter to be sold as waste-paper. He knew of no means so authentic and trustworthy of obtaining information as to the commercial and industrial progress of civilised and semi-civilised countries as these reports afforded. The benefits which these representatives of Great Britain had been able to render to the British explorers in the work of the Royal Geographical Society was nothing more than a due repayment of the debt which this country and the Government of this country owed to the Society for the voluntary work it had done in so many spheres and with such untiring and persistent energy on behalf of British political and commercial interests. Its work was increasing year by year in importance, and in any other country would be undertaken by a Government department.

In proposing the toast of "The Medallists," the PRESIDENT said: This dinner has usually taken place on the evening of the anniversary meeting; but, it having been found impossible to obtain this room for the 29th, we hold it now. One result of that is that the medals have not yet been conferred, and so I am obliged to speak of "The Medallists-Designate." You will all agree, I am sure, that the choice of the Council for the highest honours which it is in our power to bestow has fallen upon very worthy recipients. The first of these is Mr. Selous, whom we have the pleasure of welcoming this evening. Educated at Rugby under the present Bishop of London, Mr. Selous went to Africa whilst still a mere boy—so boyish, indeed, in appearance that a native chief burst out laughing when informed that he desired to shoot elephants. He remained, however, in the country, and attained there the kind of reputation which attached in old days to the slayer of the Nemean lion, and all others who helped to establish the supremacy of the featherless biped over the quadruped. Gradually, in the course of twenty years, he acquired an unique

knowledge of a vast region about which we had, before he took it in hand, only slight and scattered notices. At all times he has placed his great stores of information freely at the disposal of our Society; and recently he has done a great service to the Empire by running a road through territories which, only a very few years ago, were thought unlikely to be brought within the range of civilisation in the days of any man living. That is a splendid achievement, making it certain that his name will live in history, and entitling us to say that, in honouring him, we honour as well this Society as the company of distinguished men and women who have received our medals.

The second medallist-designate is Mr. Woodville Rockhill, an American diplomatist, who has made himself famous by his explorations in Western China and North-Eastern Tibet. The first of these was made in 1889, and carried him to a point only twelve days' march from Lhasa. His second journey was in 1892, when he tried to cross Tibet into British territory, and was only prevented doing so by the failure of supplies. Everywhere he has surveyed, everywhere he has studied the ethnology as well as the languages of the lands he has visited, and has gained a name, not only as an explorer but as an Orientalist. Many of you will remember that he came hither lately and read to us a very interesting paper; but he was obliged to return immediately to America, and that is the reason why we do not see him here to-night. I must accordingly lay upon our distinguished countryman Mr. Selous the duty of replying for both our medallists-designate, and I do so with the certainty that he will fulfil that, like all other duties which have ever been laid upon him, to admiration.

Mr. SELOUS responded for the medallists.

The toast of "Prosperity to the British Empire" was proposed by Sir ROBERT HERBERT, and responded to by General Sir RICHARD MEADE and Sir CHARLES TUPPER.

The PRESIDENT proposed "Literature, Science, and Art, in the Colonies," and the toast was responded to by Mr. C. H. PEARSON.

Mr. H. SEEBOHM proposed the "Allied Sciences," to which Lord KELVIN, President of the Royal Society, replied.

The toast of the "Sister Geographical Societies" was proposed by Mr. DOUGLAS W. FRESHFIELD, and responded to by the Rev. S. A. STEINTHAL (Manchester).

Sir GEORGE BOWEN proposed the "Guests," for whom the SWEDISH MINISTER replied.

The concluding toast was "The Royal Geographical Society," which was proposed by Mr. W. T. THISELTON DYER. The PRESIDENT replied as follows:—

At this late hour my words must be few, but there are one or two things which I should like to say in replying to the toast which Mr. Dyer has proposed in such friendly terms. In leaving the chair of the Royal Geographical Society I look back with pleasure upon the almost unclouded prosperity which it has enjoyed for the four years during which I have had the honour of presiding over its destinies. Each one of these years would have seen a nett increase to our numbers if the terrible epidemic of 1891-2 had not so grievously swelled our Obituary. This year, however, we have sprung forward again, and our nett increase has been no less than one hundred and sixty-six. We have now three hundred and fifty-eight more members than we had four years ago, in all close upon three thousand seven hundred. Since the commencement of 1893 new members pay £5, not £3, as entrance money, but that fact does not seem in the slightest degree to have deterred candidates from coming forward. Our papers during the present Session have been unusually numerous, and their scientific quality has been much above the average. If latterly there have arisen some differences of opinion between the

Council and a section of the Fellows I hope that my readiness to spring into the gulf for the sake of the Republic and of woman may have a good effect. I should like to take the opportunity of the presence of two very distinguished members of the Senate of the University of London to express to them by word of mouth what we have again and again expressed in writing, that is, the gratitude of the Society for the use of its theatre. Ere long we shall have to take up most seriously the question of raising a new and very large building to meet our increasing wants, but, meantime, I trust that if we continue to have the use of the theatre the character of our papers will do as they have done of late years even more and more honour to the locality in which they are delivered. I shall have a further opportunity of thanking many people who have assisted or co-operated with me; but the presence of Mr. Osler and Mr. Fitch with us to-night makes this the most fitting occasion to thank them and their colleagues.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian, R.G.S.*

[THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. R. = Comptes Rendus.	S. = Society, Société, Selskab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mittheilungen.	Z. = Zeitschrift.]

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

EUROPE.

England—Lake District.

Haviland.

The Geographical Distribution of Disease in Great Britain. By Alfred Haviland. Second edition. London, Swan Sonnenschein & Co., 1892: size 10 × 6½, pp. xvi. and 406. *Maps. Price 16s.*

The geographical conditions of the Lake District are considered in all their aspects with relation to disease, other parts of the country are only generally treated. The result is an interesting example of applied geography, touching on the true function of geographical science—the elucidation of the influence exercised by the natural conditions of the Earth's surface upon the human race. It is designed as the first part of an extensive work, taking up the whole of Great Britain in its large natural divisions, and explaining for each, by reference to conditions of soil and climate, the remarkable differences in the distribution of various diseases which have been proved to exist.

England—London.

Buchan.

The Temperature of London for 130 years, from 1763 to 1892. By Dr. Buchan. From the '*Journal*' of the Scottish Geographical Society for 1892: size 11 × 7, pp. 11. *Presented by the Author.*

The mean annual air temperature of London is deduced as 50°·2 F., the mean

January temperature $37^{\circ}\cdot6$, the mean July temperature $63^{\circ}\cdot7$. For the last 35 years the annual mean has been 50° , the first four months of the year being about half a degree warmer, and the last four months of the year fully three-quarters of a degree colder than the long-period mean.

England and Wales.

Bevan.

Home Geography of England and Wales for the use of schools. By [the late] G. Phillips Bevan. With twelve coloured double-page maps. London, Swan Sonnenschein & Co., 1893: size 8×5 , pp. 248. Price 4s. 6d.

This work to be useful must be supplemented by careful teaching. It follows the unfortunate plan of taking the county as a unit, and gives no generalised description, consequently no idea of the structure or physical geography of the country is conveyed. River and railway systems treated in detached portions as they happen to bound or traverse each county become very confusing.

Europe—Geodetical.

Helmert.

Die Europäische Längengradmessung in 52 Grad breite von Greenwich bis Warschau. I Heft Hauptdreiecke und Grundlinienanschlüsse von England bis Polen. Herausgegeben von F. R. Helmert. Mit zwei lithographirten Tafeln. Berlin, Stankiewicz (Veröffentlichung des königl. preussischen geodätischen Institutes und Centralbureaus der internationalen Erdmessung) 1893: size 12×9 pp. 264. Presented by the Royal Prussian Geodetic Institute.

Hungary—Tatra.

Grissinger.

Studien zur physischen Geographie der Tatra-Gruppe. Von Dr. Karl Grissinger. Separat-Abdruck aus dem xviii; Jahresberichte des Vereines der Geographen an der Universität Wien. Wien, 1893: size $9\frac{1}{2} \times 6$, pp. 82. Presented by the Author.

Italy and Russia.

Pierling.

L'Italie et la Russie au xvi^e siècle. Voyages de Paoletto Centurione à Moscow.—Dmitri Guérassimov à Rome.—Gian Francesco Citus à Moscow. Par P. Pierling. Paris, Leroux, 1892: size $7 \times 4\frac{1}{2}$ in., pp. vi, 134. Presented by the Author.

Centurione found his way to Moscow in 1519 in order to negotiate for a trade route between India and Europe, passing down the Oxus and up the Volga. The result of his journey and subsequent negotiations between Moscow and Rome are recorded in the book.

Poland.

Morfill.

Poland. By W. R. Morfill, M.A. London, Fisher Unwin, 1893: size $8\frac{1}{2} \times 5\frac{1}{2}$ in., pp. xvi. and 390. Map. Price 5s. Presented by the Publisher.

The latest volume of the "Story of the Nations" series gives the history of Poland, compiled anew from original sources, and told in an impartial spirit.

Russia.

Whishaw.

Out of Doors in Tsarland; a record of the seeings and doings of a wanderer in Russia. By Fred J. Whishaw. London, Longmans, Green & Co., 1893: size $8 \times 5\frac{1}{2}$ in., pp. viii. and 380. Price 7s 6d. Presented by the Publishers.

Bright sketches of scenes in Russia, written in a light and bantering style.

Russia—Anthropology.

Zograf.

Les types anthropologiques des Grands Russes des gouvernements du centre de la Russie. Par N. Zograf, Moscow.

This French abstract accompanies a great volume in Russian descriptive of the types of inhabitants in Great Russia, and illustrated by numerous portraits and statistical diagrams. The memoir is presented by the author.

Scotland—Edinburgh.

Cadell.

Some ancient landmarks of Midlothian (with map). By Henry M. Cadell, of Grange, B.Sc.

An interesting reconstruction of the scenery of the site of Edinburgh in prehistoric times before the elevation of the 25-foot raised beach or the draining of the numerous lakes and marshes which formerly existed.

Switzerland—Census.

Les Resultats du Recensement Fédéral du 1^{er} Décembre, 1888. Deuxième Volume. La population répartie d'après le sexe, l'état civil et l'âge. Berne, 1893: size 11½ × 9, pp. 51* and 216. *Plates 4.*

Switzerland—Neuchatel.**Graf.**

Notice sur la plus ancienne carte connue du Pays de Neuchâtel, par le Dr. J. H. Graf. Neuchatel, 1892: size 9½ × 6, pp. 30. *Presented by the Author.*

ASIA.**India.****Younghusband.**

The Invasion of India by Russia. By Captain [G. J.] Younghusband. Size 10 × 6½, pp. 22. *Map. From the 'Nineteenth Century' for May, 1893.*

India—Burma.**Cunningham.**

Mahabodhi or the great Buddhist Temple under the Bodhi-tree at Buddha-Gaya. By Major-General Sir A. Cunningham, R.E., K.C.I.E. London, W. H. Allen & Co., 1892: size 13 × 10, pp., text, 88, *plates, xxxi. Presented by the Secretary of State for India.*

Full description of the present state of this remarkable temple and historical notes regarding the various alterations it has undergone.

India—Census.

Census of India, 1891. Vols. I. and II., Assam. By E. A. Gait (Shillong). Vol. VI., Berar. By Warren Hastings (Calcutta). Vols. VII. and VIII., Bombay. By W. W. Drew (Bombay). Vols. IX. and X., Burma. By H. L. Eales (Rangoon). Vols. XIX., XX., XXI., The Punjab and its Feudatories. By E. D. Maclagan (Calcutta). Size 13½ × 8½. *Maps and diagrams, 1892. Presented by the Secretary of State for India.*

Japan.**Bickersteth.**

Japan as we saw it. By M. Bickersteth. With a Preface by the Bishop of Exeter. London, Sampson Low & Co., 1893: size 9 × 6, pp. xvi. and 354, *map and illustrations. Price 21s.*

This volume describes Japan mainly from the standpoint of the Anglican missionary. Miss Bickersteth saw a good deal of the country during her eight weeks' sojourn. She visited, among other places, Tokyo, Nikko, Ikao, and Kyoto. The volume, however, is chiefly interesting for the vivid description it gives of the great earthquake which occurred at Osaka in October 1891. The author further describes her visit to Nara, the ancient capital of Japan; her voyage across the Inland Sea; and visit to Kiushiu.

Kashmir.**Knight.**

Where Three Empires Meet. A narrative of recent travel in Kashmir, Western Tibet, Gilgit, and the adjoining countries. By E. F. Knight. With a map and 54 illustrations. London, Longmans, Green & Co., 1893: size 9½ × 6, pp. xvi. and 496. *Price 18s. Presented by the Publishers.*

Mr. Knight visited Kashmir as a literary tourist, joined the Hunza-Nagar Expedition as a volunteer and saw some active service in the gorges of the Karakoram. He describes his experiences and observations with effect, and has written a most readable book. The present state of Kashmir is admirably sketched, and the character of the many native peoples met with in those remote regions is cleverly described. The map, only a sketch, is sufficient for its purpose, and the illustrations are all of great interest.

Mongolia.**Gilmour.**

More about the Mongols. By James Gilmour. Selected and arranged from the diaries and papers of James Gilmour, by Richard Lovett, M.A. London, Religious Tract Society, 1893: size 8 × 5½, pp. 320. *Presented by the Religious Tract Society.*

Contains a graphic account of a journey across the Gobi from Peking to Kiakhta twenty years ago.

Persia.**Biddulph.**

Four Months in Persia and a Visit to the Trans-Caspian. By C. E. Biddulph, M.A. London, Kegan Paul & Co., 1892: size $10\frac{1}{2} \times 7$, pp. 138. Price 3s. 6d. Presented by the Publishers.

Mr. Biddulph's journey in Persia in 1891, about which he communicated a paper to the Society (*Proceedings* 13 (1891): 645), is here described at greater length, but without a map. There is added to it an account of a visit to Trans-Caspia in 1890.

AFRICA.**Algeria and Tunis.****Boutroue.**

L'Algérie et la Tunisie à travers les Ages. Par Alexandre Boutroue. Paris, Leroux, 1893: size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. 62. Maps. Presented by the Author.

Historical notices on Northern Africa which formed the subject of two papers to the Paris Geographical Society.

Algeria—Kabylia.**Liorel.**

Races Berbères. Kabylie du Jurjura. Par Jules Liorel. Preface de M. Emile Masqueray. Paris, Leroux. Not dated (1893): size $7\frac{1}{2} \times 5$, pp. xviii. and 544. Presented by the Publisher.

A comprehensive study of the Algerian Kabyles systematically arranged. The work loses a good deal of its value through the absence of illustrations or maps.

Eastern Sudan.**Hassan.**

Die Wahrheit über Emin Pascha, die ägyptische Aequatorialprovinz und den Soudan. Von Vita Hassan unter der Mitarbeit von Elie M. Baruck. Aus dem französischen Original übersetzt und mit Anmerkungen versehen von Dr. B. Moritz. Berlin, 1893, Dietrich Reimer: size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xvi. and 224. Portrait of Vita Hassan. Price 3 m. 50. Presented by the Publisher.

Description by Emin's apothecary, the late Vita Hassan, of the fall of the Equatorial Province.

Somali-land.**Swayne.**

Report on the Reconnaissance of Northern Somali-land, February to November, 1891. By Captain H. G. C. Swayne, R.E., and Lieutenant E. J. E. Swayne, 16th Bengal Infantry. Bombay, 1892: size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 116. Incomplete. Presented by the Secretary of State for India.

The copy of this Report sent for use in the Library is mutilated by the excision of several pages and numerous passages, which for political reasons the Government of India think it right to keep confidential. The map is also withheld. In spite of the suppression of this information, the Report contains much that is of great interest geographically.

Southern Africa.**Bryden.**

Gun and Camera in Southern Africa. A year of wanderings in Bechuanaland, the Kalahari Desert, and the Lake River Country, Ngamiland, with Notes on Colonisation, Natives, Natural History, and Sport. By H. Anderson Bryden. London, E. Stanford, 1893: size 9×6 , pp. xiv. and 544. Maps and illustrations. Price 15s. Presented by the Publisher.

A well illustrated account of life and conditions in some of the recently opened up regions of South Africa.

NORTH AMERICA.**American Birds.****Keeler.**

Evolution of the Colours of North American Land Birds. By Charles A. Keeler. (Occasional Papers of the California Academy of Sciences, III.). San Francisco, 1893: size $10 \times 6\frac{1}{2}$, pp. xii. and 362. Coloured Plates. Price \$5. Presented by the California Academy of Sciences.

Lake Superior—Raised Beaches.**Lawson.**

Sketch of the Coastal Topography of the North Side of Lake Superior, with special reference to the abandoned strands of Lake Warren (the

greatest of the late Quaternary Lakes of North America). By Andrew C. Lawson, University of California. Pp. 181-289 of the Twentieth Annual Report for the year 1891 of the Geological and Natural History Survey of Minnesota. Minneapolis, 1893. *Presented by N. H. Winchell, Esq., State Geologist.*

The memoir is illustrated by a sketch-map of the north shore of Lake Superior and several photographs of the terraces, the structure of which is examined.

Manitoba.

Legge.

Sunny Manitoba; its Peoples and its Industries. By Alfred O. Legge. London, T. Fisher Unwin, 1893: size $8\frac{1}{2} \times 6$, pp. 297. *Map and plates. Price 7s. 6d. Presented by the Publisher.*

The author's aim in the present volume is to impart to the reader an impartial and accurate account of the province of Manitoba, mainly as to its suitability for emigration purposes.

United States—Gravity Determinations.

Mendenhall.

Determination of Gravity with half-second pendulums on the Pacific Coast, in Alaska, and at Washington, D.C., and Hoboken, N.J. By T. C. Mendenhall. Being Appendix No. 15 to Report of the U.S. Coast and Geodetic Survey for 1891. Washington, Government Printing Office, 1892: Size 7×6 , pp. 62. *Presented by the Author.*

Description of methods and results of observations made in 1891; illustrated by figures of the apparatus employed.

United States—Maps.

Science 21 (1893): 225-227.

Davis.

The Topographic Maps of the United States Geological Survey. By W. M. Davis, Harvard College.

United States—Pacific Slope.

Wiley.

The Yosemite, Alaska, and the Yellowstone. By William H. Wiley and Sara King Wiley. *Reprinted from 'Engineering.'* London, *Engineering Office.* Not dated (1893): size $11\frac{1}{2} \times 9$, pp. 230. *Price 16s.*

A practically worded record of a trip through California, Alaska and the Yellowstone Park, profusely illustrated. One of the best works of its kind.

CENTRAL AND SOUTH AMERICA.

Argentine Republic.

Akers.

Argentine, Patagonian and Chilian Sketches, with a few Notes on Uruguay. By C. E. Akers. London, Harrison & Sons, 1893: size $8 \times 5\frac{1}{2}$, pp. 190. *Price 5s. Presented by the Publishers.*

Mr. Akers spent two years in South America as special correspondent of the *Standard*, and naturally has a good deal to say of the commercial and political situation of the republics he visited. The main value of his book lies in the account of long journeys through the still little-known parts of Patagonia which are gradually being invaded by salt-merchants and cattle-ranchers.

Colombia.

Núñez and Jalhay.

La Republique de Colombie. Geographic, Histoire, Organisation Politique, Agriculture, Commerce, Industrie, Statistique, Tarif douanier, Indicateur, commercial, etc. Par Ricardo Núñez et Henry Jalhay. Bruxelles: Stevelinck 1893: size $10 \times 6\frac{1}{2}$, pp. 262. *Map. Presented by the Authors.*

The Consul-general and Consul of Colombia in Belgium have written this book in order to make known the character and resources of their little-known country. The data are, as far as possible, official, but figures are given under reserve as "Statistical science is still in its infancy in Colombia." The work bears every mark of conscientious compilation.

Patagonia.

Dixie.

Memories of a Great Lone Land. By Lady Florence Dixie. Size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. 9. *From the 'Westminster Review,' March, 1893.*

Reminiscences of Patagonia.

POLAR REGIONS.

- Greenland.** *P. A. Nat. Sci. Philadelphia* (1892): 342-349. **Peary.**
Report of the Operations of the North Greenland Expedition of 1891-1892.

AUSTRALASIA AND PACIFIC ISLANDS.

- Australians.** **Adams.**

The Australians: A Social Sketch. By Francis Adams. London, T. Fisher Unwin, 1893: size $8\frac{1}{2} \times 6$, pp. 314. Price 10s. 6d. Presented by the Publisher.

Consists of a series of essays mainly dealing with Australian social life, most of which have already appeared in the *Fortnightly Review*.

- Chatham Islands.** **Forbes.**

The Chatham Islands and their Story. By Henry O. Forbes: size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. [22]. From the 'Fortnightly Review' for May 1893.

- Queensland.**

Letters from Queensland. By *The Times* Special Correspondent. London, Macmillan & Co., 1893. Size $7\frac{1}{2} \times 5$, pp. 110. Price 2s 6d. Presented by the Publisher.

This is a reprint of the admirable series of letters from Queensland, published in the *Times* in December 1892, and January and February 1893.

- South Australia.** **Hodder.**

The History of South Australia from its foundation to the year of its Jubilee, with a chronological summary of all the principal events of interest up to date. By Edwin Hodder. With two maps. London, Sampson Low, Marston & Co., 1893: 2 vols., size $8\frac{1}{2} \times 5\frac{1}{2}$, vol. 1, pp. 392, vol. 2, pp. viii., and 400. Price 24s.

The only map accompanying this valuable history represents the state of the land as regards ownership or occupation. The other "map" is a diagram. The earlier chapters dealing with exploration and the first settlement of "the province of South Australia," are full of geographical interest.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

- Geodesy.**

Tableau des Longueurs du Pendule aux différentes stations de l'Empire Russe et de l'étranger, observées par des Savants Russes. St. Petersburg, 1893: size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. [2] and table. Presented by the Russian Geographical Society.

- Geological Climate.** **Seward.**

Fossil Plants as Tests of Climate, being the Sedgwick Prize Essay for the year 1892. By A. C. Seward, M.A., F.G.S. London, C. J. Clay & Sons, 1892: 8vo, pp. 152. Price 5s. Presented by the Author.

A vindication of the value of fossil plants as indicative of the climate in past ages. Two chapters are devoted to the geographical distribution of existing plants and the effect of low temperature on vegetation. The whole essay shows wide reading, and the collection of references makes a useful bibliography.

- Oceans.** *Globus* 63 (1893): 317-319. **Swarowsky.**

Entstehung und Dauer der Weltmeere. Von Dr. A. Swarowsky. Wien.

A contribution to the controversy on the permanency of oceans and continents.

- Physical Geography.** **Klein.**

Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik Meteorologie, und physikalischen Erdkunde. III. Jahrgang 1892: Von Dr. Hermann J. Klein. Leipzig, E. H. Mayer, 1893: size 9×6 , pp. x. and 350. Price 2m.

An excellent epitome of the most important researches in physical geography published in 1892.

Tides.**Whall.**

Handy Book of the Tides, with fifteen charts, showing the state of the tide at every hour at Dover. Compiled from various sources by W. B. Whall. Fourth edition. London, G. Philip & Son. *Not dated* (1892?): size $11\frac{1}{2} \times 9$, pp. 10, and charts. *Price* 3s. 6d.

The charts show by arrows the set of the tides in the North Sea and round the British Islands every hour.

GENERAL.**Colonisation.****Greswell.**

Outlines of British Colonisation. By the Rev. William Parr Greswell. With an Introduction by the Right Hon. Lord Brassey, K.C.B. London, Percival & Co., 1893: size $8 \times 5\frac{1}{2}$, pp. xvi. and 358. *Price* 6s.

A concise and well-written epitome of British colonisation historically considered. More than a quarter of the book is composed of statistical appendices, and there are numerous references to the literature regarding the various colonies.

Columbus.**Porto-Alegre.**

Colombo. Poema por Manoel de Araujo Porto-Alegre. Rio de Janeiro, 1892: size $9\frac{1}{2} \times 7$, pp. xxiv. and 736. *Presented by the Historical and Geographical Institute of Brazil.*

Columbus.**Silva.**

Christovam Colombo e o descobrimento da America pelo conselheiro J. M. Pereira da Silva. Rio de Janeiro, 1892: size $9\frac{1}{2} \times 7$, pp. xii. and 180. *Presented by the Author.*

Cook's Journal.**Wharton.**

Captain Cook's Journal during his First Voyage round the World made in H.M. Bark *Endeavour*, 1768-71. A literal transcription of the original MS. With Notes and Introduction. Edited by Captain W. J. L. Wharton, R.N., F.R.S., Hydrographer of the Admiralty. Illustrated by maps and facsimiles. London, Elliot Stock, 1893: size 11×8 , pp. lvi. and 400. *Price* 21s. *Presented by the Publisher.*

A special notice of this book will be given.

Educational.**Hughes and Williams.**

An Introduction to the Study of Geography, Mathematical, Physical, Political, and Commercial. By William Hughes and J. Francon Williams. London, G. Philip & Son, 1893: size $7\frac{1}{2} \times 5\frac{1}{2}$, pp. viii. and 100. *Plute.* *Price* 1s. *Presented by the Publishers.*

Educational.**Lyde.**

The Glasgow Series of Elementary Geography. By Lionel W. Lyde, M.A. London, Percival & Co.: size $6\frac{1}{2} \times 4\frac{1}{2}$. *Maps.* New Zealand and Tasmania, 1892: pp. 92. British North America, 1892: pp. 88. British South Africa, 1893: pp. 84. Australia, 1893: pp. 168. *Price, each volume, 1s. net.*

The volumes of this little series dealing with the British Colonies gain greatly from an educational point of view in being all the work of one practical and skilled teacher.

Educational—Textbooks.**Redway**

Textbooks of Geography. By Jacques W. Redway. Size $10 \times 6\frac{1}{2}$, pp. [10]. *From the 'Educational Review' (New York) for February, 1893.*

Criticism of the modern American geographical textbooks.

Italy—Official.

Bollettino Consolare pubblicato per cura del Ministero per gli Affari Esteri d'Italia. Vols. I.—XXIII. Torino, Firenze, Roma, 1861-1887: size $10 \times 6\frac{1}{2}$. *Plates, &c.* *Presented by the Italian Government.*

Italy—Official.

Bollettino del Ministero degli Affari Esteri. [10 vols.] 1888-1892. Roma, 1888-1893: size $10\frac{1}{2} \times 6\frac{1}{2}$. *Maps, &c.* *Presented by the Italian Government.*

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

British Isles.

Habenicht.

Sydow-Habenicht: Methodischer Wand-Atlas, Nr. 14: Britische Inseln. Orohydrographische Schul-Wandkarte nach E. v. Sydows Plan, bearbeitet von H. Habenicht. Scale 1:750,000, or 10·3 geographical miles to an inch. Gotha, Justus Perthes, 1893. 9 sheets. *Price* 10 marks.

England and Wales.

Ordnance Survey.

Publications issued since May 12th, 1893.

1-inch.

ENGLAND AND WALES: 341, 342, Hills photozincographed in brown, 1s. each. Scotland, 118 Hills 1s.

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(E. Stanford, Agent.)

ASIA.

Indian Government Surveys.

Surveyor-General of India.

Indian Atlas, 4 miles to an inch. Quarter Sheets:—39 N.E. Parts of Districts Ahmednagar (Bombay Presidency), Bid, and Naldurg (Nizam's Dominions). 43, N.E. Parts of Districts Shimoga, Kadur and Hassan (Mysore). 60, S.W., Parts of Districts Mysore, Hassan and Tumkur (Mysore). Sheets:—73, Parts of Districts Amroli, and Wun (Bihar) of Indur, and Surpur Taudur (Nizam's Dominions), of Warilha, Chanda, Nagpur, and Bhandara, and of Native State Bastar (Central Provinces), 78, District Chingleput, and parts of North Arcot and Salem (Madras Presidency) and Kolar (Mysore). 111, Parts of Districts Muzaffarpur, Darhanga, Bhagalpur and Purnea (Bengal), and of Nepal.—Assam Survey, 1 inch to 1 mile. Sheet No. 38 (2nd edition), Districts Kamrup and Darrang. Seasons 1866 to 1868, 1872 to 1875, and 1885-86.—Bengal Survey, 1 inch to 1 mile. No. 103, Angul Estate (Orissa). Season 1888-89.—Bombay Survey, 1 inch to 1 mile, No. 154, Parts of Baroda State, Rewa

Kantha Agency and Broach District. Seasons 1875-76 and 1890-91. No. 186, Parts of Rewa Kantha Agency and Khandesh District. Season 1889-90.—Punjab Survey, 1 inch to 1 mile, No. 227, District Ferozepore, Faridkot, and Patiala State. Seasons 1877-79 and 1887-88. No. 241, District Hissar and Patiala State. Seasons 1876-78, 1883-84, 1887-88, 1889-90. No. 274, Districts Hissar and Karnal and Patiala State. Seasons 1870-72, 1882-84, and 1887-88.—North-Eastern Frontier, 1 inch to 4 miles, No. 15, N.E. (2nd edition), parts of Naga Hills, Naga Tribes and Manipur (Assam), and of District Upper Chindwin (Upper Burma). Season 1885-86. With Supplement. No. 15, S.E. (4th edition), parts of Manipur (Assam) and of District Upper Chindwin (Upper Burma). Seasons 1881-82 and 1886-88. No. 22 S.W. (2nd edition), parts of Singpo Naga Hills and of the Upper Irrawaddy and Chindwin Valleys (Upper Burma). Seasons 1887-92. No. 23, S.W. (6th edition), parts of Districts Bhamo and Katha (Upper Burma). Seasons 1887-88, 1889-90.—South Eastern Frontier, 1 inch to 4 miles, No. 1, S.W. (2nd edition), parts of the Lushai and Chin Hills, of the Districts of Upper Chindwin and Pakokku (Upper Burma), of Northern Arrakan (Lower Burma), and of the District and Hill Tracts of Chittagong (Bengal). Seasons 1853-66, 1871-72, 1888-90, and 1891-92.—South-Eastern Frontier, 1 inch to 8 miles, No. 4, parts of Districts Katha, Bhamo, Ruby Mines, Shwebo, Sagaing, Mandalay, and Shan States (Upper Burma). Seasons 1886-91. No. 6, parts of Districts Toungoo, Shwegying, Salween, and Tharrawaddy (Lower Burma), District Pyinmana and South Shan States (Upper Burma), and of Siam.—Central India Agency, 1 inch to 16 miles. 2 sheets. Additions and corrections to May 1891.—District Backergunge, 1 inch to 4 miles. Additions and corrections up to June 1892.—Map of the Meerut Division, prepared in accordance with Govt. N. W. P. and Oudh P. W. Dept. Circular, No. E., dated May 16th, 1872. Revised in March, 1890. 3 Sheets. 1 inch to 4 miles.—Map of Agra Division, prepared in accordance with Govt. N. W. P. and Oudh P. W. Dept., Circular No. E., dated May 16th, 1872. Revised in March 1890. 1 inch to 4 miles. 2 sheets.—Burma and its adjacent countries, 1 inch to 48 miles. October 1892.—Map to accompany Preliminary Report on the Chin-Lushai Country, dated December 1892. 1 inch to 8 miles. (No. 204, Intelligence Branch.) 31 sheets. (*Stanford Agent.*)

AFRICA.

Nyasaland.

Wiese.

Rugg's New Map of the Western Nyasaland Gold-fields. Specially illustrating the explorations of Carl Wiese, from 1885 to 1891. Scale 1:1,000,000, or 13·6 geographical miles to an inch. By Rowland Rugg. London, Forster Groom. Cape Town, Juta, 1892. Price 10s. 6d.

This map has been compiled to illustrate the explorations of Carl Wiese, between the years 1885 and 1891, and shows his routes, the trading stations, and positions of the old Portuguese gold-fields of Northern Zambesia. In the construction of the map the route surveys of Carl Wiese, and the travels and works of Monteiro, Gametto, Lacerda, Livingstone, Bowler, and others, have been used, and the Portuguese statistics of the Maravia gold exportations for the years 1810, 1830, and 1885, have been consulted by the compiler. Numerous useful notes on the character of the country, the minerals, game, &c., are given with some remarks as to routes and commerce. As, practically speaking, there has been no previous good map of this district, this cannot fail to be of service to any person travelling in this part of Africa, as routes are laid down, and the localities where gold is found are shown in yellow.

Transvaal.

Penning.

Stanford's Map of the Transvaal Gold-fields, with the geology of the Southern Part of the Transvaal. By W. H. Penning, F.G.S., &c. (late H.M. Geological Survey of England), 1893. Scale 1:1,000,000, or 13·6 geographical miles to an inch. London, published by E. Stanford, 1893. *Presented by the Publisher.*

The geological colouring which appears on this map is founded on the surveys of Mr. W. H. Penning, who is also the author of the pamphlet *The Geology of the Southern Transvaal*, which accompanies the map. Although the area geologically coloured is small when compared with the whole of the South African Republic, it

nevertheless embraces an area 450 miles in length and about 50 miles in breadth. A plan of the Witwaters Rand Gold-field is given on an enlarged scale, and geological sections from Klerksdorp by the Houdtbosch Rand and the High Veldt to Duibels' Kantoer, and across De Kaap Valley by Barberton to Swaziland; a geological section on a still larger scale from Houdtbosch Rand across the Witwaters Rand to the Megaliesberg Mountains is also given.

Tunis.

M. le Ministre de l'Instruction Publique.

Atlas Archéologique de la Tunisie. Edition Spéciale des Cartes Topographiques publiées par le Ministère de la Guerre, accompagnée d'un Texte Explicatif par MM. E. Babelon, R. Cagnat, S. Reinach, Membres de la Commission de l'Afrique du Nord. Livraison 1. Paris, Ernest Leroux, Éditeur, 1893.

This is the first issue of an archæological atlas of Tunis. The map employed as a basis is that which has been prepared under the direction of General Derrecagaix, and published by the Service Géographique de l'Armée, Paris. In the compilation of this work very valuable assistance has been rendered by the officers of the topographical survey, who, in the course of their duties, have taken notes of all the ruins and mentioned them with particulars in their reports, which have been made all the more valuable by the plans, drawings, and photographs, which have accompanied them. The Commission de l'Afrique du Nord has entrusted to three of its members, whose names are mentioned in the title, the preparation of this atlas for publication. The position of each ruin is indicated in red with a number attached, by the use of which a short description of the ruin itself can be found in the indices given. It is the intention of the Commission to publish with each part a scientific description of the country embraced in the map, in the hope that it may be serviceable, not only to archæologists, but to all who take an interest in a country which affords such abundant evidence of a past prosperity.

AMERICA.

Argentine Republic.

Nolte.

Plano Catastral de la Provincia de Entre-Rios, construido segun los datos mas recientes. Scale 1:1,500,000, or 6·8 geographical miles to an inch. Casa Editora, Ernest Nolte, Libreria Alemana, Buenos Aires, 1892.

A considerable amount of detail is given on this map; it shows the positions of the different colonies, together with the location and extent of private estates, as well as the names of the owners. All means of communication are laid down, and a general map of the railways of the Argentine Republic is given as an inset.

PHOTOGRAPHS.

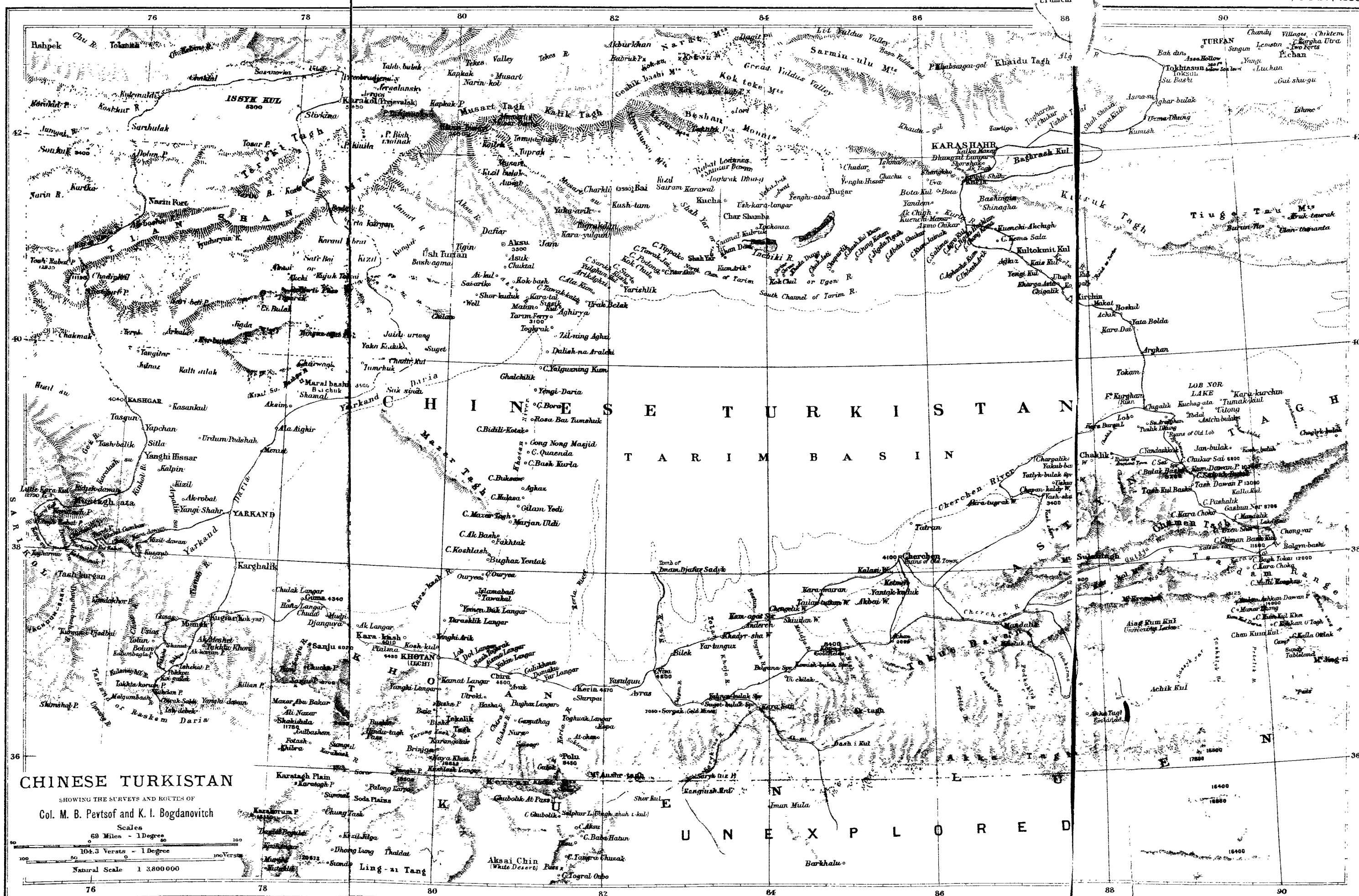
Australia.

Elder Scientific Exploration Expedition.

Two Albums containing one hundred and seven photographs taken by members of the Elder Scientific Exploration Expedition, 1891-92. *Presented by the South Australian Branch of the Royal Geographical Society of Australasia.*

These photographs, which have been taken by members of the Elder Scientific Exploration Expedition of 1891-92, form a valuable addition to the Society's Collection. They give a very clear idea of the country traversed by the exploring party, the views having been well chosen. There are also several interesting photographs of the natives. Considering the difficulties under which these photographs were taken, they are very satisfactory, and are made all the more valuable by having been carefully labelled.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





The Geographical Journal.

No. 2.

AUGUST, 1893.

VOL. II.

JOURNEYS IN FRENCH INDO-CHINA (TONGKING, ANNAM, COCHIN CHINA, CAMBODIA*).

By the Hon. GEORGE N. CURZON, M.P.

THE regions which are embraced by the general title of French Indo-China, and of the methods and incidents of travel in the different parts of which I propose to give some account, comprise the southern and eastern portions of the geographical area commonly described as the Indo-Chinese peninsula, and consisting of the territories situated between India and China, or in other words, between the basins inclusive of the Irrawadi and the Red River. The geographical interest of this country consists in the immense rivers by which it is intersected, and to whose alluvial bounty it for the most part owes its origin, and to the mystery which still overhangs its interior recesses; there on the confines of China, Burma, Siam, and Annam, wild and little known tribes inhabit the pathless mountains, and unexplored rivers thunder down profound ravines. Its commercial interest lies in the competition which it has engendered between rival European nations for the easiest approaches to the remote but populous provinces of Western China, on whose borders it lies; and the immemorial but lengthy caravan routes conducting to which it is sought to supersede by the agency of steam locomotion by river or by land. Its political interest lies in the fact that within the last thirty years the ownership of this vast tract, obeying the universal law by which the hitherto hidden corners of the world are gradually yielding up their secrets to civilisation—has changed and is even now changing hands; the conquest of the French having placed them in possession of the

* The orthography throughout this paper has been made to correspond with the published Rules of the Society. The spelling Cambodia has been adopted on account of its common usage in this country, in preference to Kamboja or Cambogia. The author would prefer the last-named form, as being in stricter accordance both with general acceptance and with local pronunciation.

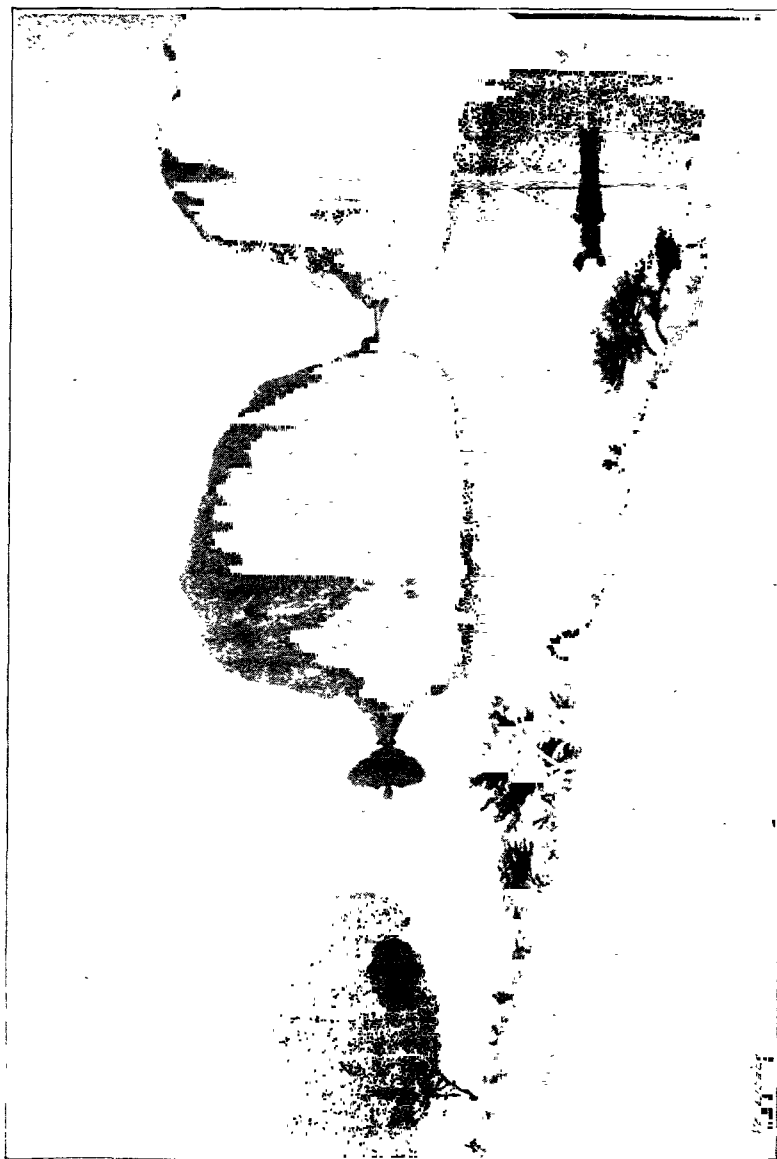
The map to accompany Mr. Curzon's Paper will be given with the second instalment in the September number.

whole of its eastern face from Cambodia to Tongking, and the acquisition of Upper Burma by the British having brought the latter into similar contact both with China herself and with the frontiers of the one surviving independent Asiatic kingdom, that now separates England from France in the Far East, viz., Siam. The French parts of Indo-China, with which alone I propose to deal in this paper, comprise four separate territories, in different stages of political absorption. These are, in order from north to south, Tongking, Annam, Cochin China and Cambodia. Their united populations amount to about 18,000,000; they extend along a coast-line 1700 miles in length, and they embrace an area $\frac{1}{5}$ times as large again as France. I will first deal with the main geographical characteristics presented by this dominion, the different sections of which possess a physical unity that facilitates the task of description.

I. GENERAL GEOGRAPHICAL CHARACTERISTICS.

In no part of the world has water exercised a more potent agency in determining the destinies or in providing the livelihood of man. The bulk of the French possessions owe their existence to the deposits of great rivers, the Red River (Song Koi), Black River (Song Bo or Da Jiang), and Clear River (Song Lo) in the north, and the magnificent volume of the Mekong in the south, and may be divided throughout into two areas—the mountains through which these rivers, rising in the plateaux of Central Asia and Tibet, force their way seawards, and the plains or deltas which they have themselves almost wholly created along the coast. The entire populated and wealthy part of Tongking consists of the delta of the Red River with its confluent, which is 80 miles broad at its base. The whole of Cochin China and much of Cambodia consists of the delta of the Mekong. The intervening territory of Annam, in so far as it consists of plain land lying between the mountains and the sea, is also the creation of smaller streams flowing down from the highlands of the interior.

In each of these regions, under conditions differing very slightly, the process of territorial formation, or encroachment upon the sea, can be watched in active development. On the maritime fringe the brick or gruel-coloured streams, surcharged with alluvium, leave their detritus, which the tide is not sufficiently powerful to remove, and which gradually solidifies, and gives birth to a rank vegetation of mangroves and other aquatic plants. Sometimes for a while these form floating islets, which eventually coalesce and find a common anchorage. Sometimes they are covered with saline swamps, in which case they are utilised by the natives as salt-pans. A little later, as the sea recedes, they can be drained and planted, and in a few years, what began as a muddy lagoon is transformed into a ricefield of cloth of gold. The process of



BAY OF ALONG.

formation is so rapid that Hanoi, the capital of Tongking, which is now 60 miles in a direct line from the sea, was upon it in the 7th century A.D., whilst in the 17th, the Dutch, who traded upon the Red River, had their maritime port at Hougyen, now 35 miles in the interior. I visited a place named Fat Diem, at the mouth of the Dai, on the southern confines of the delta, which has been entirely reclaimed from the sea within living memory, and is now occupied by smiling clusters of villages and rice-plots, irrigated by numerous canals. In Annam the growth of the land at the expense of the sea is accelerated by the action of the tides and winds, principally the north-east monsoon, which pile up long sand-dunes upon the coast, behind which the rivers, unable to pour their entire volume into the sea, spread themselves out in broad and sluggish lagoons, chafing idly to and fro, and daily diminishing in depth, till they too submit to the inevitable process and are choked. The same conditions are responsible for a phenomenon of constant occurrence on the Annamite coast facing eastwards, viz., the formation of sandbars off the mouth of almost every river without exception. These constitute during many months of the year an impracticable barrier to navigation, and compel vessels of any burden to lie out in an offing which rarely furnishes a secure anchorage. On the bars themselves the breakers form successive files of plunging foam, whose grey crests can be seen tossing skywards, and whose thunder can be heard for miles. At Hue, the capital of Annam, I could always hear the moaning of the bar at Thuanan, where is the river embouchure, over 6 miles distant as the crow flies, and at Vinh the roar was audible over an even greater distance. I crossed the bar of the Kua Hoi mouth of the Song Ka River near the latter place in a small native sampan, built mainly of bamboo, which charged the breakers full tilt, just after the crest had broken, and which, if it missed the right moment by a fraction of a second, was deluged from end to end. In Cochin China and Cambodia, a further phenomenon is encountered in the existence of immense tracts of country lying below the river-level, which in times of high water are converted into enormous swamps or lakes, whence only the upper branches of the trees emerge. The great lake of Talé Sap, *i.e.*, the Inland Sea, in Cambodia, which is a depression in the soil of this character, and is fed by the Mekong, experiences transformations so violent that in the rainy season its length increases from 70 to 120 miles, its area is tripled; and while in the low waters the fish, with which it abounds, can almost be ladled from its shallow trough, then from 2 to 4 feet deep, it is swollen by the floods between June and September to a depth of 30 to 50 feet. In Cambodia the abodes of man adapt themselves to these fluctuant conditions, for they consist of palm-leaf and bamboo huts, which, if belonging to a stationary village, are raised upon wooden piles from 5 to 15 feet in height above the ground, or are placed upon floating rafts moored by long poles to the bed of the stream,

and capable of being shifted from site to site according to the height of the waters.

One other phenomenon must be noticed that is common to these regions, and is replete with a geological as well as geographical interest. This is the existence of a peculiar rock formation, composed of a calcareous stone or marble, superimposed above the Devonian schists, and presenting the most picturesque and fantastic contours both in the sea, at no great distance from the mainland, and also at several points along the river valleys which have in earlier days been similarly situated. It consists of detached blocks or humps of rock, rising to a height of from 50 to 500 feet, with scarped sides and faces, but with summits and ledges covered with a superb and gracious vegetation. The action of the sea has carved the sides and hollowed the interior of these rocks into vast caverns and grottoes, and has fretted their outline into strange and abnormal shapes. The most remarkable instance of this phenomenon occurs in the Bay of Along, with its prolongation the Bay of Fai-tsi-long, an archipelago of thousands of islets so formed, which fringes the coast of Tongking for a distance of over 100 miles from the east border of the Red River delta almost to the Chinese frontier at Cape Pak-lung. One may spend days sailing in and out of the islets of this astonishing inland sea, which I do not hesitate to characterise as one of the wonders of the world, and which far excels the better known beauties of the Inland Sea of Japan. Low tunnelled passages, accessible only at low water, conduct to hidden basins or remote caverns in the heart of some of the rocks, and till recent times afforded an impenetrable retreat to the corsairs who devastated these waters. Near Turan, the maritime port of Hue, a cluster of similar rocks, called by the French the Marble Mountains, rises abruptly from the sand-dunes on the seashore, and is perforated with grottoes, which have been utilised by Buddhist monks for the establishment of one of those retreats wherein they appear uniformly able to combine aesthetic attractions with devotional needs. Their altars are enshrined in the bowels of the earth, and the ecstatic face of the gilded god shines faintly from the cavernous gloom. The other places in Tongking and Annam where I noted or was apprised of the same formation are (1) On a plain to the east of the Kua Kam, that embouchure of the Thai Binh, upon which lies the commercial port of Haifong; (2) between Kaobang and Langson on the east frontier; * (3) between Ninh Binh and the Catholic settlement of Kesho on the Dai, at a distance of over 30 miles from the sea; (4) at Dienho on the frontier between Tongking and Annam; (5) immediately south of Thanh-hoa, the capital of the province of that name. I have been informed that a precisely analogous formation is also visible at Lakhon on the middle waters of the Mekong.

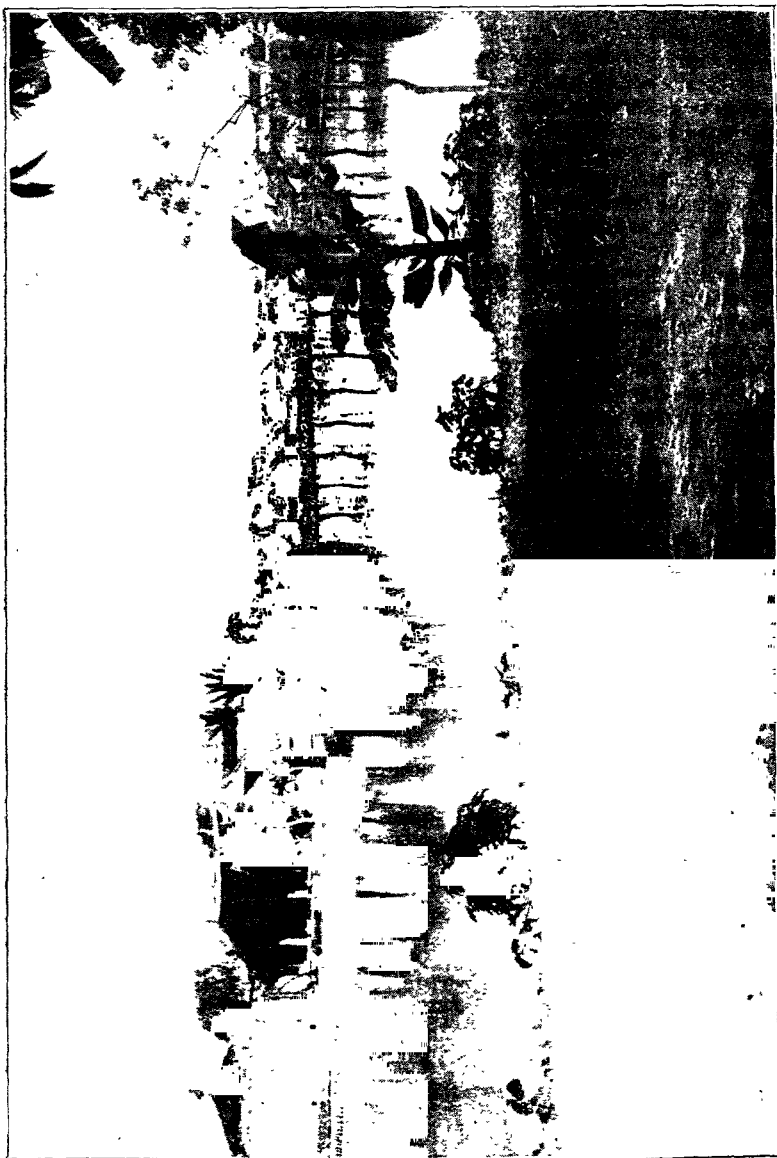
* For a description of these, *vide* a paper on the Hill Slopes of Tongking, by J. G. Scott, in *Proceedings of the R.G.S.* 1886 (new series), Vol. VIII., pp. 234-5, 240.

II.—TRAVEL IN TONGKING.

From these general remarks I now turn to a more detailed description of travel in the various territories already named. I shall not occupy myself long with Tongking, inasmuch as travel in the delta of the Red River is performed almost entirely by river-boat, whether the steamers of the French Companies, or the Annamite sampan. The latter craft, though of modest dimensions, is well adapted for locomotion on the countless channels and canals with which, like a network, the country is intersected. In the centre an arched covering or hutch of palm-leaves or matting, shelters that portion of the boat in which the traveller takes his meals and sleeps, the only serious discomfort being the inability to adopt any but a sitting or recumbent position. In the fore and aft parts of the boat stand the rowers, propelling the craft with an oar, attached to a peg by a straw or rattan band, with a motion not unlike that of the Venetian gondolier. The mother of the family very often plies the bow oar, and children of five and six even lend a hand. When the central part of the boat is occupied by a passenger, the family, to whom the sampan is their sole home, either sleep, cook, and live in a similar partition adjoining the central hutch or in the open part of the boat forward. On the prow is painted, particularly in Annam and Cochin China, a black and white eye—one among many signs of Chinese influence. The landscape in the delta seldom varies, the rivers, streams, and canals flowing between banks which are fringed with areca palms, bananas, and bamboos, detached rectangular clumps of which, scattered over the surface of the country, invariably indicate the site of a village, whose palm-leaf huts are buried in the interior, and are accessible only by a labyrinth of narrow alleys cut in the thicket, easily defensible, and known to the villagers alone. Save for these interruptions of the general level, the country is entirely planted with rice, and the peasants working in the sodden patches look like black insects crawling upon a carpet of gold.

III.—TRAVEL IN ANNAM. (1) HANOI TO HUE.

I pass to Annam, a country possessing slightly different and even more interesting features, both political and geographical; political, because it is still administered by an Asiatic government, and contains at Hue, the capital, one of the few remaining courts where a purely Oriental and un-Europeanised ceremonial, modelled, like that of Korea, upon the China of the Ming dynasty, enshrouds the person of an Emperor whom his subjects regard as the Son of Heaven; geographical, because the diminution of water and the prevalence of mountains render the configuration of the country more diversified, and lend a greater romance to travel. Almost the sole channel of locomotion in Annam—



SMALL LAKE, HANOI.

until a railroad is made from Hanoi to Hue, of which the French talk much, but whose construction in the immediate future I greatly doubt—is a track known as the Mandarins' Road. This route, which has existed in some form or other from early times, was entirely reconstructed at the beginning of the present century from Saigon, the capital of Cochinchina, to Langson on the Chinese frontier, by the Emperor Gia Long, the founder of the reigning dynasty and of a reunited Annamite Empire. In Annam it usually runs at a slight distance from the coast or traverses the lower spurs of the mountains. In four places it climbs to some height from the sea, where it crosses by means of *cols* or saddles the transverse ridges which are pushed out at right angles from the main range. These passes are: (1) the Pass of Deo Ngang, sometimes called the Gates of Annam, between the provinces of Hatinh and Kwang Binh; (2) the Col des Nuages, also called the Iron Gates, between the provinces of Kwang Duk and Kwang Nam on the road between Turan and Hue; (3) the pass above the bay of Kwi Kwik, between Kwang Nam and Kwang Ngai: and (4) the Pass of Deo Sa, between Fu-yen and Khanh-hoa. The two first of these, the second of which I shall shortly describe, present a great similarity. The mountain is climbed by stairways cut or constructed in the face of the rock, and at the summit the pass is closed by a gateway in a crenellated wall. There appears to be a second and alternative route, at any rate south of Hue, amid the mountains in the interior; but I am not aware of any one by whom it has been mapped or explored, and a traveller would find it a difficult task without official aid.

In the parts where I travelled upon the Mandarins' Road between Ninh Binh and Hue, it had been in places repaired during the early part of the year for the passage of the Governor-General, and was commonly a flat track about 20 feet wide, either running upon a bank between the rice-plots or often over hot sands, whilst elsewhere, after rain, it was converted into a horrible bog. The poles of the French telegraph are planted along its side. The means of locomotion upon it are threefold, although it is seldom that the traveller is at liberty to make his choice. The first is the Annamite pony, a diminutive steed of great pluck and sureness of foot, not unlike his Korean brother, though rather a greater gentleman in appearance. He is so small that a European girth is almost always too large for his body, but he will carry a light English saddle. The natives ride him with a wooden saddle, and with a very narrow iron stirrup, which they grip in the cleft between the big toe and the remaining toes. These ponies are less quarrelsome than the Korean, and are so docile that they make no difficulty about crossing the numerous *bacs*, *i.e.* rivers, estuaries, or lagoons with which the road is intersected, and which can only be traversed in rude native boats, where a single movement of the horse would overturn the craft and its contents in mid-stream. I have sometimes had horrid

qualms while crossing a *bac* perhaps half a mile in width, with three or four ponies in the boat at the same time. In the country these ponies can be bought for £1 to £2; but in the cities, where they are ridden by French officers, and are driven both in pairs and four-in-hand, fine specimens will fetch from £10 to £20.

The second vehicle of locomotion is the hammock or palanquin, of which there are two varieties; the commoner consisting of a rude straw netting slung upon a pole, which is borne by two or more coolies; and the more elaborate official or Mandarins' palanquin, which is a net of crimson cords, has richly lacquered ends, a roof and screens, and which is carried by four or eight men. All Mandarins from the highest rank downwards travel in these palanquins, and most Europeans follow their example, especially in parts where ponies cannot march, or are not procurable. But for a tall man they are insupportable. Being fashioned to hold the diminutive Annamite, they cannot accommodate a 6-foot Englishman, and the most telescopic contraction of my lower limbs rendered it impossible for me to occupy one for longer than an hour. Seasoned travellers, however, sleep in them, while being carried along, with ease. The coolie-bearers march at a jog-trot, which enables them to cover the ground with great rapidity, and to accomplish at least 4 miles in the hour.

The third means of locomotion is the light chair, known in the East as the Hongkong chair, the back seat and foot-rest of which are attached together by cords, and which is carried by poles upon the shoulders of four or eight men. It is almost exclusively employed by Frenchmen travelling between Turan and Hue, but is not indigenous to the country, and will be found in none of the *trams*.

The mention of the latter name leads me next to describe that which is the most remarkable institution of travel in Annam. As long ago, it is said, as the eleventh century, during the dominion of the extinct empire of the Chams, there was founded a system of government postal stations called *trams* (the word is of course Annamite and has nothing to do with the English *tram*) along the main highways. These consist of posts at distances of from 8 to 15 miles apart, to each of which is attached a number of able-bodied men of the neighbourhood, who are held at the service of the state, being exempted in return from the *corvée* and from military service, and receiving a ration of rice. They are liable to be summoned at any hour of the day or night from their houses or from the fields by the *doi* or superintendent of the *tram*, who beats a drum, and, if they fail to comply at once with his orders, lays about him liberally with a stick. They are employed to carry the government post, are at the disposal of the Mandarins, and are hired by Europeans on the march. They go night and day, a messenger being sent on in advance to the next *tram* to advise the relay, and everywhere, *e.g.* at ferries, they have priority of passage. There being no beasts of

burden in the country, they are employed to convey all baggage as well as to carry the hammocks or chairs. The former are slung by cords upon bamboo poles, and are borne between two men. The caravan of quite a small party will thus frequently amount, all told, to from thirty to forty men.

The *tram* itself consists of an open house or shed, the side walls of which are made of mud wattling, and the thatch of the *attap* palm. On the floor are usually three low wooden or bamboo platforms raised about one foot above the ground, and spread with straw mats, whereon the traveller lays his couch. Sometimes there is a table in the centre and a small ancestral altar at the back. The front consists of shutters of palm-leaf or bamboo screens, which are held up by poles in the day-time but are let down at night. In villages where there is no *tram* the traveller is commonly offered the hospitality of the communal house—a somewhat similar structure on a rather more pretentious scale—which is part of the system of local autonomy that has reached so high a state of development in Annam. It is the property of the village, and the meeting-place of the council of notables; and its hospitality is dispensed by the village headman or mayor. Under his care, too, is the organisation of the village police and of the night guards. The night is divided into five watches of two hours each; and the vigilant taps of the watchman upon his *mo*, or drum, fashioned out of a hollow trunk, are an impediment to slumber.

Travelling, as I was doing, in semi-official fashion under the courteous patronage of the French, I was enabled to proceed with greater rapidity than the ordinary traveller, having covered as much as 40 miles in the day, whilst our party also met with a sort of reception at each village to which we came. A drum would be heard beating, and numbers of men would come out carrying banners of red, blue, and green flying from the top of bamboo poles. Escorted by these individuals, and by umbrella-bearers who ran behind and held over our heads the red or green painted official parasol of Annam, we entered the village, a coolie sweeping the road clear of dust in front of us. In this fashion we advanced to the communal house, before which a table would be placed in the open street, shaded by an official umbrella, and supporting a number of plates containing bananas, oranges, eggs, and other offerings; sometimes chickens or a kicking pig in a wicker hamper. Here the mayor would be standing, and, unless restrained, would kneel down and make his *lai*, or official obeisance, by three times touching his forehead upon the ground. Outside the larger towns we would be met by the local governor, or Mandarin. He would appear in his official hammock, attended by two or three umbrella-bearers according to his rank; by lictors carrying in a long case the recognised instruments of flagellation (administered in the same fashion as at an English public school, and considered no indignity even by persons of high position); by his pipe-

bearer; by a domestic carrying a wooden box in which were stored away his writing, smoking, and chewing materials; and by pikemen and banner-men. His own dress would, as a rule, consist of a tunic of dark figured silk or brocade worn over white cotton drawers and white stockings, and of a neatly folded dark blue, black, or green turban made of native *crêpon* or silk crape. In the lettered class it is fashionable to wear some of the nails long as an indication of superiority to manual labour; and I have seen a Mandarin the nail of whose left thumb described an aerial parabola not less than $3\frac{1}{2}$ inches in length. I met many Annamite officials and Mandarins in the course of my travels, and was favourably impressed with their polish of manner, their correctness of deportment, and the quickness of their intelligence. They are divided into two categories, civil and military; and into two classes, with first and second degrees. The former are entirely recruited by examination, and their rank, precedence, and functions are defined by the rigour of an unbroken etiquette. No inferior Mandarin will take a seat while his superior is standing, or commence a conversation until the other has spoken. A small ivory plaque, hanging by a coloured cord upon the right bosom, indicates their rank; and those who are in the Government employ receive from the State a salary in money, rice, or silk. They seal their letters with a wooden die stamped with a character or symbol, which is smeared with a red paste obtained by scraping two potsherds together.

I will not describe the incidents of daily travel because they did not vary much from each other; nor are there many differentiating marks in the Annamite villages and towns. The traveller desirous of marching overland to Hue from Hanoi will probably abridge the earlier part of his journey in the delta by taking one of the river-boats to Ninh Binh on the Dai, from which place I append an itinerary of the stopping-places and distances as far as Hue, a total distance of about 360 miles. A stranger travelling with official assistance, his arrival being telegraphed in advance, and the *tram* service being set in operation so as to cause no loss of time in changing the relays, can cover this distance in about twelve days. Anyone not possessing these facilities would probably take much longer. I diverged myself from the Mandarins' Road to go by boat to Fat Diem, at the mouth of the Dai, where is a remarkable establishment maintained by an Annamite Mandarin known as Père VI., who is also a Roman Catholic priest, belonging to a family who have for long been Christians. He lives in great state in his patrimony, which he has himself, in the main, reclaimed from the sea, where he keeps a large guest-house for the accommodation of strangers, and where he has erected as many as four churches or chapels, one nearly as large as a minster, rather for the gratification of his own architectural tastes than for the service of his congregation, who are not more than sufficient to fill the smallest of the quartet. I rejoined the Mandarins' Road at

Thanh-hoa, the capital of the province of that name, which is situated near the Kua Chao, one of the numerous mouths of a fine river called the Song Ma. The provinces through which one passes subsequently are Ngean, of which the capital is Vinh, situated at a few miles distance from the Kua Hoi, one of the nine mouths of the Song Ka, another considerable river; Hatinh, with capital city of the same name; Kwang Binh, with capital Dong Hoi; Kwang Tri, with capital of the same name. At these places, which are under native rule as being part of the Empire of Annam, the French Protectorate is represented by French Residents, exercising general functions of supervision, but no direct administrative control; or by detachments of the native militia officered by French inspectors. The provinces themselves embrace the plains lying between the mountains and the sea—a strip which varies from 5 to 15 miles in width—and the more accessible mountain valleys. Annamite jurisdiction or French influence can hardly, except in a few places, be said to extend beyond the main crest of the range; the interior being inhabited by tribes either independent or dependent upon the Siamese, who are strongly planted upon the Mekong, and who claim to exert a sovereignty over the entire watershed draining into that river. This claim is disputed by the French, who, on their side, are continually despatching exploring parties into the hills with the view of drawing the tribes within the radius of French influence. The only points along this line of coast where it is possible for a steamer to anchor during the winter months are Vinh, Ron, and Dong Hoi.

MANDARINS' ROAD—HANOI TO HUE

	Kilometres.
Hanoi <i>via</i> Hongyen, Fuli, and Kesho to Ninh Binh.	
Ninh Binh to Choganh	8
Binson	12
Dolen or Daulin	10
Trinson	13
Thanh-hoa	9
(Alternative route. Fat Diem to Dienho, 8 kilometres; Hatrung, 16; Thanh-hoa, 42)	
Futinh Gia	30
Thoson	10
Hoa Mai.. .. .	25
Fu Dien	24
Pagode des Paons	11
Vinh	24
Hatinh	48
Kyanh	50
Sudong	35
Gates of Annam	13
Ron	12
Botrach	32
Dong Hoi	23
Mi Daiet	28
Carried Forward	421

MANDARINS' ROAD—HANOI TO HUE—*continued.*

					Brought Forward	..	Kilometres.
Mitho	421
Cho Huyen	20
Kwang Tri	35
Fuok	31
Hue	40
							30
Total	577

577 kilometres = 360 miles.

The towns encountered along this route differ only from the villages in consisting, as a rule, of a cluster of the latter massed together, sometimes behind the shelter of a wall, and protected by an immense fortified enclosure, called the Citadel. The villages are composed of houses roofed with a thick thatch of palm leaves, and walled with the same material or with a watling of bamboos and mud. The interior of the poorer cottages comprises solely a number of low platforms, for purposes of work by day and sleep by night, and the cooking arrangements at the back. In the richer dwellings the centre is occupied by a reception-room, corresponding in arrangement with the communal hall, which I have already described, and containing a central table and arm-chairs, an altar behind, and sleeping stands on either side. In a Mandarin's house the altar will be adorned with handsome censers and with a shrine containing the ancestral tablets; while long boards, inlaid with Chinese characters in mother-of-pearl or brightly coloured embroidered hangings, will hang against the pillars. Life among the poorer classes is mean and squalid, but not dirty; and the streets, even of the humblest hamlet, have an orderly and picturesque appearance, very different from the filth of China and Korea. Yellow fox-like dogs prowl about; pigs with piebald skins and pendent bellies run in and out of the houses; and naked, shaven-pated children abound. In the next superior grade of architecture tiles take the place of thatch, and wood and bricks of the mud walls. Finally, the citadel of the capital towns, laid out on the Vauban plan by French engineers at the end of the last and beginning of the present century, in the Gallophil days of Gia Long, or built in imitation of their designs, is a vast quadrilateral space, frequently some miles in circumference, surrounded by a red brick wall, rising from a moat, with projecting bastions and lofty gate-towers. In the interior is usually an official residence containing a large reception-hall, erected for the Emperor or his official representative, and several big granaries for the storage of rice. These great indefensible fortresses seem to have been designed to contain the entire population in times of peril, and before the widespread use of scientific implements of warfare. From any other point of view their vast extent is a danger, and they are now useless.

One of the exasperating features of travel in Annam is the confused and confusing nomenclature of places. I have said that the towns are

frequently composed of several villages, and similarly the villages also consist of several hamlets. One arrives therefore at a place to find that it has four names; (1) the name of the particular hamlet or cluster of houses; (2) the name of the larger unit or village to which it belongs, and which may contain two to three, or even seventeen to eighteen different hamlets, each with a name of its own; (3) the name of the market, which is sometimes outside the village, and usually has a title of its own; and (4) the name of the *tram* which also has a separate designation (recognisable in the province of Hue by the prefix *Thua*). It may easily be imagined under these conditions how difficult it is to construct a map in the first place, and into what a quandary one is often plunged by such maps as already exist. Even the French Government map, with which I travelled, but of which I was not able to procure a copy, is frequently incorrect, and offers but an uncertain guide.

The markets to which I have alluded are among the most picturesque and characteristic of Annamite spectacles. They are held on stated days in the week either in an open place in the middle of the village, frequently tiled over or thatched as a protection against the sun—the site being the property of the commune and being let out in plots or stalls—or sometimes in the open country at a central spot between several hamlets. Marketing is entirely conducted by the female sex, who may be seen for miles walking in single file along the narrow dykes that separate the soaking rice-plots, and carrying their produce in baskets at the end of a bamboo pole. Others will approach in sampans along the waterways and canals. When business opens there is just such a jabbering as in the monkey-house at the Zoo. The women squat down by the side of their wares, and intersperse a ceaseless chatter with chewing of the betel leaf, and ejection of long splashes of scarlet saliva from their discoloured mouths. You will see exposed for sale pigs, chickens, and ducks in hampers, fish, fresh, slimy, shell, and sundried, big prawns and tiny land-crabs, cabbages, radishes, the areca nut, vermicelli, cakes, sweetmeats, and eggs. Elsewhere will be cheap articles of furniture or raiment, tin lamps for petroleum, pottery, brassware, opium pipes, bracelets, necklets, amber buttons, palm-leaf hats, turbans, Bombay cottons and scarves.

From the number of temples, or pagodas as they are called, which are scattered throughout the country, in every picturesque or graceful spot, on wooded knolls, at the top of mountain passes, on the banks of rivers, or amid clumps of trees, one might infer that the Annamites were a people much addicted to religion. Such is not the case. Their faith is a strange and incongruous amalgam of various superstitious cults and creeds. Buddhism is more or less widely diffused, but in a very attenuated form, barnacled with all manner of corruptions. Chinese ascendancy has brought with it the ethics of Confucius, and the worship of a host of demi-gods or glorified heroes. But for the most part spirit-

worship, or a crude demonology, may be denominated the popular creed, the majority of the pagodas containing little beyond altars on which a censer smoulders to the *genius loci*, to the good spirit or the evil spirit of the site, to the dreaded tiger, or to the *manes* of some celebrity of the past. The larger pagodas consist of two or three courts, in the hindmost of which stands the temple beneath a tiled roof, closed round with wooden doors. Fantastic animals, elephants with howdahs, kings and warriors on horseback, or tigers, are painted in fresco or sometimes fashioned in high relief on the entrance gateway and around the courts; and a bizarre but brilliant effect is produced by fragments of broken pottery stuck in plaster, and forming patterns of dragons or fabulous monsters on the walls and roofs. Far away superior however to any other religious sentiment or influence is the worship of ancestors, which is predominant in the organisation alike of the State, the Court, the commune and the family. At the great annual festival of the *Tet* or New Year, the outpourings of hilarity are mingled with an elaborate ritual in honour of the dead; and the humblest house contains an altar neatly installed, and often sumptuously arrayed, whereupon tablets are erected to the memory of the departed.

Burial is the ordinary method of disposing of the dead, and large cemeteries are sometimes encountered; although a more haphazard system of interment appears to be general. The site of the grave is usually determined by augury, and may be anywhere, for instance in the middle of a ricefield. The plot is bought and paid for, and is never afterwards sold. Once a year it is visited by the relatives or descendants, cleaned and decorated. Of the tombs four varieties may be distinguished: (1) the Royal sepulchres of the reigning dynasty near Hue, which are among the finest and most beautiful in the world, consisting of hundreds of acres of wooded hill and valley laid out in terraces and lakes, and adorned with obelisks and sanctuaries; the scheme being borrowed from the mausolea of the Chinese Emperors, but the style being either original, or perhaps imitated from France; (2) the graves of the Mandarins and upper classes, which consist, like those in China, of a horse-shoe or arm-chair enclosure, faced with stone, and containing sculptured *stelæ* and altars; (3) the graves of the middle-classes, which are sometimes covered with a rectangular stone case not unlike those common in England in the last century; and (4) the graves of the poor, which are either small mounds plastered over, or circular grassy heaps. Unlike Korea, where pines are invariably disposed around or near the graves, no timber is planted about them. There is a very extensive cemetery where everyone of the above-mentioned styles may be observed outside Hue near the Altar of Heaven, which the French call the *Esplanade des Sacrifices*. There is also an old and crowded necropolis between Saigon and Cholen in Cochin China.

(*To be continued.*)

WITH THE RAILWAY SURVEY TO VICTORIA NYANZA.*

By Captain J. W. PRINGLE, R.E.

So many distinguished travellers have now journeyed from the East Coast of Africa to the great lake, that the countries I propose describing can in no way be termed new or unexplored. But perhaps no former travellers have devoted so much of their time to actual survey work as the officers who have been working with Captain Macdonald during last year (1892) between Mombasa and Uganda. An account of how this survey work was conducted, and what methods were used, may be of some interest. The Survey parties left Mombasa, on Dec. 20th, 1891, reached Machako's, Feb. 20th, 1892; Kavirondo, May 18th; Uganda, June 11th; Kikuyu, August 8th; arrived at Mombasa, September 23rd.

We commenced by attempting to obtain a skeleton outline of points fixed by triangulation, upon which to build our detail sketches. At the very outset this was found impossible without spending more time than we could well spare in clearing and cutting away the thick thorn-bush and raising well-defined triangulation points. One such point, built of dry stones by an advance party of Swahili porters, was some 6 feet high, in a small clearing surrounded by high thorn trees. On seeing its position and surroundings, we no longer wondered that we had been unable to see it. We had therefore to give up the idea of triangulation, and be content with a less ambitious survey. Accordingly every day's march was traversed and sketched with compass, watch, clinometer, aneroid barometer, and pedometer. On arrival in camp a plane-table was used from some adjacent high ground to further sketch in the country. These preliminary sketches were made on a scale of 1 geographical mile to an inch, and subsequently reduced to half that scale. A section of the route traversed was made on a horizontal scale of 1 statute mile to the inch, and vertical 100 feet to the inch.

The positions of our camps were checked daily by latitude and longitude observations of the sun and stars. For this purpose watch chronometers were used. To check the rating of these watches, we had occasional observations for absolute longitude with a telescope: such as the occultation of a star by the moon, or of one of Jupiter's satellites. Comparative checks for longitude were obtained by azimuth observations to some well-defined point we had fixed behind us, which, the latitude being known, gave us the "departure." Latitudes were fixed by altitude observations to north and south stars on the meridian. Further observations were taken frequently for the variation of the compass.

As regards altitudes obtained by the survey parties, we can in no case claim to establish absolute heights. The only instruments we used

* Map, p. 192. This paper was written in January, 1893.

for altitude observations were surveying aneroid barometers. These, in so far as they gave us relatively correct heights, were sufficient for our purpose. As frequently as halts permitted the diurnal wave corrections of these barometers were checked. We noticed that this diurnal wave correction was fairly constant in low altitudes, but in elevations over 5000 feet, or wherever there was much dampness in the air, there was considerable fluctuation before 9 A.M., at which time the diurnal correction again became regular. The heights of camps, to allow for this irregularity, were always fixed by afternoon observations. Any difference shown by an early morning reading was adjusted to the former afternoon reading; the diurnal correction again becoming normal after 9 A.M. These aneroid barometers, by means of a vernier, enabled us to read a difference of level of 5 feet. Heights of hills we did not actually ascend were obtained by theodolite angles.

I have mentioned that we used pedometers. These, it is generally stated, are unreliable; but our experience was otherwise. We generally had three pedometers working with each survey party, and frequently checked these over measured distances. The result in one instance was that when two of our parties met in Kavirondo, after each had marched some 250 miles by different routes, we found a difference in dead reckoning position of only 2 miles. In fact, we have been able to discover sudden variations in the rating of our watches by the accuracy of these traverse sketches.

The following were the principal routes traversed by the Railway Survey parties:—

1. Between Mombasa and Tsavo. Two routes—the usual caravan route, by the so-called Taru Desert, and the Sabaki Valley route.

2. From Tsavo to Nzoï. The caravan route through Kibwezi, and the Athi River route. The “Sabaki” River, above its junction with the Tsavo River, is known as the “Athi.”

3. From Nzoï to Machako's three routes were traversed. The caravan road through the Ulu Hills, another to the east, following the Machako's River, and the third to the west, and outside the Ulu Hills, on the edge of the great Kapite Plain.

4. From Machako's to Naivasha. Three routes were surveyed over the Athi Plains into Kikuyu, thence two down the Kikuyu escarpment, into the lakeland of the great meridional rift.

5. From Lake Naivasha three main routes were examined to the Victoria Nyanza. One to the south, from Lake Naivasha, through Sotik and Lumbwa, to Ugowe Bay; another to the north, by Lake Baringo, crossing the Elgeyo and Kamasia escarpments; and the third lying between these northern and southern routes. This is generally known as the Guaso Ngishu route, which ascends the Mau escarpment from Lake Nakuro, and thence follows the Guaso Masa and Nzoia Rivers.

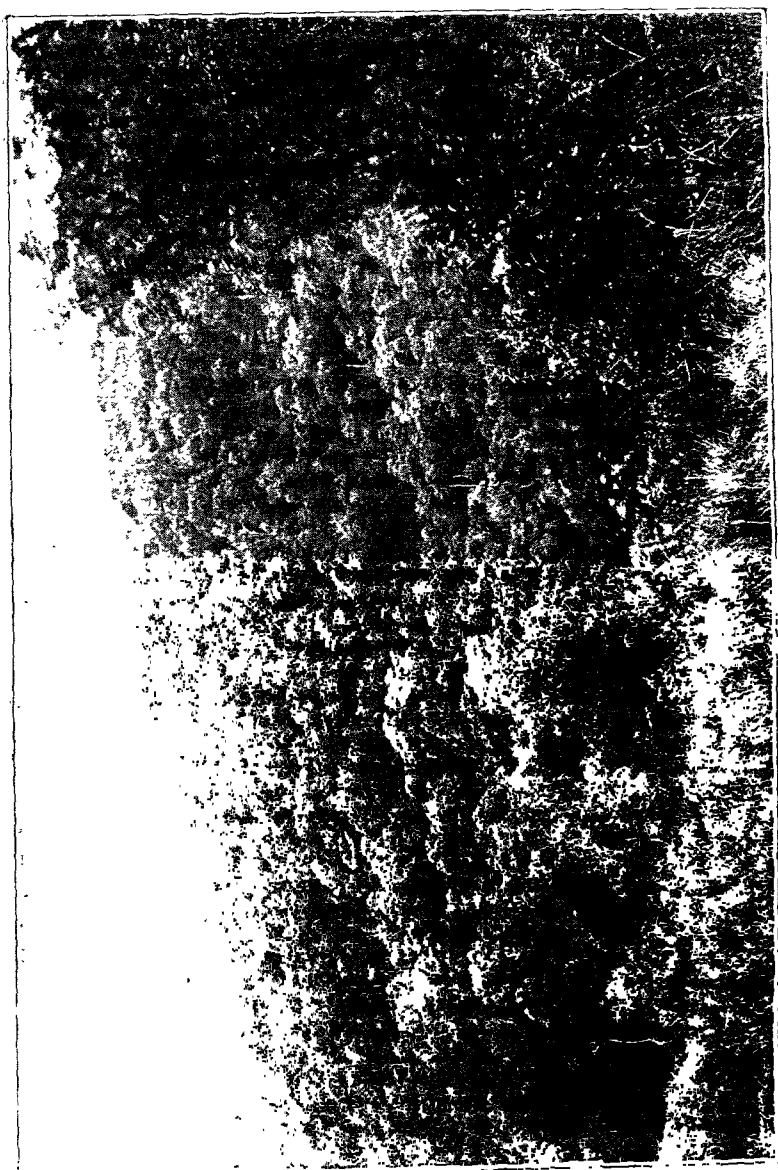
On the shores of the Victoria Nyanza our survey for the railroad was completed; but two of us travelled thence along the northern shores of the Lake into Uganda, doing as much survey work as the limited time at our disposal allowed.

Further minor routes were surveyed, one towards Mount Elgon from Kavirondo, another through the Samia Hills, and round the north-east corner of the Victoria, a third through Kabras, and others round Machako's and the Ndara Hills. The limits of the survey are, roughly, between the parallels of latitude 1° N. and 4° S., and longitudes 32° and 40° E.

Let me now try and describe the general characteristics of the country and people you would see travelling along some of these routes. The island and town of Mombasa you have heard of frequently, so it need not now detain us. One noteworthy point is the fine and well-protected harbour on the south and west of the islands known as Port Reitz and Port Kilindini. We will cross to the mainland, and there we will see a green fertile belt of country, 10 to 15 miles wide, which stretches upward to a line of low coast hills. As you climb these heights you will pass through plantations of graceful coconut palms, fields of Indian corn and simsim, patches of sweet potatoes and millet, groves of bananas and magnificent mango trees. Streams course the hill-sides; and everywhere are signs of a bountiful nature. It is warm—unpleasantly so—in the sun; but in the shade, even out of doors, and at night, it is cool and pleasant.

From the summit of this fringe of hills, some 600 to 900 feet above the sea, as you gaze inland, you will see nothing but what looks like a great grey sea, rolling away from below you to the dim horizon. You are disappointed. There is nothing tangible, no bright colouring or bold outlines. Nothing but an indistinct flat wash of neutral tints, with here and there a silver streak, and in the far distance low grey hills. But once descend into the valley lying at your feet, and it is no desert we enter. Gently undulating country, rising always but imperceptibly. Indeed, for the next 30 miles the general upward gradient is scarcely more than 1 in 200. All around you will see low flat-topped thorn trees, blossoming white and red, long waving grass, dense clumps of aloe and euphorbia, long-armed creepers of the convolvulus tribe, huge bulbous roots that look like masses of rock, and if it be the morning, all is sparkling with the diamond dust of dew.

A red ribbon-like path leads you on, here winding round a fallen tree, there gradually forced to turn aside for an ever-growing thorn. The country is sparsely populated by the Wa-Druma who are but poor cultivators. And so on, till the twin hills of Taru are reached some 45 miles from the coast. These hills are densely clothed with unapproachable thorn and euphorbia, and only rise some 300 feet above the surrounding



MAU FOREST.

plain. Here are to be found in the sandstone rock the far-famed water-holes, which during the dry season are the only sources of water supply in the Duruma country. Some say these are artificial, but surely they are too deep and too regular in shape to be the work of the present type of East African savage. It is more probable they are the result of disintegration set up by decaying vegetation in natural hollows in the rock. Another theory is that they are natural air holes in the rock strata; this is supported by the fact that walking over these rock formations an occasional footstep makes a hollow resounding noise denoting the presence of still covered holes. These waterholes are met with in many other places on the caravan route, but none are so remarkable in extent and regularity of formation as are these at Taru. We have reached a height of 1300 feet at Taru camp, and before us stretches the so-called Taru desert. A change is noticeable in the surface features of the country. No more undulations of ridge and valley but an almost level plain. The next 30 miles showed a general gradient of only 1 in 400. It is not a sandy desert as we understand the word. The soil is less fertile, bright red in colour showing a large amount of mineral composition, especially iron, and is exceedingly porous. The same dwarf thorn trees are seen, though growing more sparsely, the grass is more patchy and the euphorbia and aloe are rare, but the wild fig-tree seems to flourish. Except for a day or two after rain has fallen, no water is met with for 33 miles, and then after climbing 1000 feet from the camp to the top of Maungu Hill, the rock-bound pool is sometimes found dry and water is still 12 miles off. Water tins are generally carried between Taru and Maungu, and the marching done by night, but even so the porters often suffer great privation. I have known men barter half a month's pay for a drink of water from a more fortunate or more provident companion's supply. But the distance is much less than has been hitherto estimated. Even by the winding caravan path it is only some 34 miles from Taru to Maungu camp, and this distance will no doubt be considerably shortened by the road now in execution by the I. B. E. A. Company. Maungu is one of a series of isolated ranges running north and south; other ranges are Kisigao, Kilibasi, Pikapika to the south and east, and the Ndara and Ndi hills to the west. Instead of shales and sandstones we have metamorphic formation, gneiss, schist and hornblende. This Maungu range was formerly inhabited by a colony of Wa-Teita, but is now uninhabited. The highest point on Maungu is some 3400 feet above the sea.

West of Maungu the same level thorn bush country extends to the Ndara Hills. You will see, however, for the first time what have been so aptly termed "earth-boils." These are sometimes small conical shale or clay hills, sometimes long strata of granite or igneous rock which rise above the bush like huge hog backs. Among the Ndara Hills live the

Wa-Teita, their villages composed of round thatched huts on the hill-tops, and cultivation in every nook and cranny that holds the fertile soil. Sugar-cane is much grown, also Indian corn, bananas, tobacco and sweet potatoes. These same Wa-Teita are beginning to appreciate the advantages of trade and civilisation. They farm ostriches, and carry on a large trade with the coast in goats. They have large plantations of maize and millet in the plain round the foot of the hills, and were it not that they are generally at war with their neighbours, the Masai and Wakamba would doubtless extend their holdings further into the plain, and along the banks of the Voi River. This stream, the first of any size that is met with, rises in the Bura Hills to the westward, and intersects the Ndara Hills. Emerging from these on to the plain, its waters are soon absorbed by the thirsty soil, and except after rain none ever reaches the sea. Water, however, may generally be obtained by digging in the sandy bed. Its banks are clothed with dense jungle and aloe, the home of innumerable guinea fowl.

Crossing this river you will traverse another plain, park-like in its appearance, and bounded on the west by another range of hills known as Ndi Hills, also inhabited by Wa-Teita. This plain is studded with these curious earth-boils and rock outcrops I have mentioned, and to the east stretches away to the Sabaki River. On this plain and also between Maungu and Ndara, the palah antelope, zebra, lesser koodoo, and in the rains giraffe may be met with. The highest point crossed is some 2100 feet, and an easy descent takes you down into the valley of the Tsavo River. The surface soil for the first time becomes stony, and outcrops of rock numerous. This Tsavo River is some 145 miles from the coast by caravan road, but only 125 by railway. It is fed by the snows of Kilimanjaro, and the stream of water is very considerable. You will find we are still only 1450 feet above the sea, having ascended on an average 10 feet a mile. The banks of the river are studded with a fibrous palm, and the rocky bed is the home of at least three kinds of excellent fish. The caravan road crosses the Tsavo at a point only some 5 miles above its junction with the Sabaki River, and not 15 miles to the westward of this junction, as has been estimated. So far as we have come, the gradients are easy except in the ascent to the low coast hills, and beyond the Voi and Tsavo Rivers nothing of any size has to be bridged.

You will enter the confines of another country on the left bank of the Tsavo River, known as Ukambani. This is bounded on the north and east by the Athi River, and the edge of the great Kapite Plain on the west. The country is divided into two well-known districts, that of Kikumbuliyu to the south, of which Kibwezi, the home of the Scottish East African Mission, may be termed the centre, and that of Ulu to the north, a central feature of which is the far-seen Nzoi Peak. At first no change is noticeable in the general features of the country. The same

thorn bush and grass country prevails, but the rise is much more perceptible. At Kibwezi, some 60 miles from the Tsavo, we have risen 1600 feet, and are 3100 feet above sea-level. Here, amidst forest and wood, grassy glades and the most delightful pure water flowing over lava boulders make the country attractive to the eye. Fine straight timber for building purposes is easily obtainable, and the soil is what is known as "black cotton," or a fine volcanic loam. A curious feature is a strip of a mile or more in extent of loose lava rock on either side of the Kibwezi mission. This is bad to travel over, but has been quite avoided to the south by a new road lately made by Mr. Wilson. I have noticed also that wherever this black cotton soil is found in conjunction with forest growth, butterflies with the most gorgeous colouring seem to thrive, and this is especially the case at Kibwezi, Ngongo Bagas, and Uganda.

Beyond Kibwezi another isolated range of hills known as Mbinzau is crossed, and the country becomes much more open. Before Nzoi is reached, three streams have to be crossed. The first, known as the Kiboko River, with beautiful clear water, rises in the Ongolea Hills. Only 2 miles further on is a brackish stream called the Salt River. This winds its way from a salt swamp surrounded by low bare hills on the edge of the Kapiti Plain into the Athi River. During the rains, owing to the volume of fresh water brought in by its tributaries, the saltiness of the water is not noticeable, but in dry weather nothing but a series of pools is to be found of decidedly brackish taste. Herds of wildebeest, zebra, several kinds of antelope, and the ungainly rhinoceros swarm on the banks of these rivers, attracted by the rich grass and brackish water. All the streams met with in Kikumbuliya flow from west to east direct to the Athi River.

A long waterless march over rough uneven country, much intersected by dry watercourses, brings us to the Ndange or Wakafukoa River. Another march and we are camped in the fertile and populous district of Nzoi. The Nzoi peak is a landmark for many miles. It has an elevation of 2400 feet above the surrounding country, and a total altitude of 6100 feet. To the south it ends abruptly in a precipice some 1000 feet high, and is 7 or 8 miles in length. Easy of ascent from the east, on the west it is crowned by precipices which are generally unassailable. The hill-top is only some few yards wide, and is covered with bracken fern 4 feet high. Maidenhair and other ferns grow luxuriantly in the rock crevices at an elevation of 5000 feet. An incident in our climb up this hill will show how one's best endeavours are sometimes thwarted. We had meant to take a round of azimuth observations from the top of the hill, and some men were carrying a theodolite and other instruments behind us. We came to a rather awkward rift in the hill-side, and proceeded with perhaps more noise than necessary to take off our boots, the better to climb it. Suddenly down from a hole in the cliffs above

us came a swarm of angry bees, and though we managed to get past with but few stings, our men with the instruments had to beat an ignominious and hasty retreat down the hill, and so we got no observations. Moreover we had to wait till dark when the bees were asleep before we could venture down again. The climate here is temperate and cool; the maximum variation of temperature noticed by us was between 58° and 82° Fahr., and this even though at an altitude of only 3600 feet.

Northward of Nzoi to Machako's, 310 miles from the coast, the country is mountainous, innumerable streams are met with, and the watersheds are curious and complicated. The caravan road winds up a torrent bed in loose shingle and sand, and the ascent would be difficult and tortuous for anything but a bridle path. The hills are populous and much cultivated. The elevation of the Company's Post at Machako's is 5400 feet, showing a general ascent of 1700 feet in 45 miles from Nzoi. Here at Machako's it is so cold and chilly in the evenings and at night, that we found living in tents decidedly bracing. In these hills all sorts of English vegetables have been grown and done well. Sugar-cane flourishes, quantities of Indian corn, millet whimbi (*Elusine coracana*) and other cereals are grown, bananas and tobacco are met with in abundance, and many kinds of bean and pea. Cattle, sheep and goats are met with in large numbers, especially down Machako's River and to the east of Machako's Hills.

Perhaps an account of the appearance, manners and customs of the Wa-Kamba or people of this country of Ukambani may be of interest. The men are well built, but rather slight and not tall. They wear little or nothing but ornaments, sometimes a goatskin is thrown over their shoulders, or a piece of cloth dyed a reddish brown with a mixture of clay and grease. They smear their bodies from head to foot with the same lubricant, and file their front teeth into points. In this habit they are recognisable from the Wa-Teita. They are fond of hanging small brightly-burnished copper coins in rows across their faces, or of wearing a small gimcrack mirror suspended upon their foreheads. They have curious decorations for their feet, which resemble nothing so much as spats made of strings of white or pink beads. They may still further beautify their persons by a dab or two of yellow or blue colour round the eyes. They are armed with a bow and quiver of arrows, knobkerry and spatulate-shaped sword. The arrows are either for show or for war—in the latter case they are larger and poisoned.

The women have the same liking for bead and brass wire ornaments, and nearly the same disregard for clothes. Whilst unmarried they shave their heads, but after marriage they grow a top-knot of hair resembling nothing so much as a rough mophead.

Their villages consist of clumps of from five to fifteen huts, low and grass-thatched, the sides often of timber or wattle and daub. Each small village has its own headman who acknowledges the supremacy of

no other chieftain, so that unity of action is considerably discounted. This chieftainship is not necessarily hereditary, but is generally claimed by the most wealthy man. There is, however, in each district a council of Wa-ze or old men, who advise and consult on questions of national import. The ceremony of marriage is very similar to that described by Mr. Thomson among the Wa-Teita. After consulting the maiden and her parents, and agreeing upon the number of cows or goats he must pay, the would-be bridegroom has to carry the lady off despite her pretended struggles and the feigned hostility of her family. The christening ceremony consists in smearing the face of the child with the blood of a freshly killed fowl. When a man or a woman dies, the body is not buried, but as in the Masai country, is carried away and left in the bush. A chief is sometimes buried as the only exception to this rule. The villages are not permanent and are only occupied for a few years at most. A few deaths or an outbreak of sickness causes the abandonment of the old village in favour of a new site, and the unsanitary surroundings of a village do not render a change of site surprising. They are not great warriors, they elect no general, and each man fights as he thinks fit. The fight generally resolves itself into a few flights of arrows from some secure hiding, and then a general retreat.

The Wa-Kamba are hard-working and industrious, and have already shown aptitude for European methods and ideas of work in the construction of a road under the supervision of Mr. Wilson of the S. E. A. Mission. They are great agriculturists, and never lose an opportunity of extending their fields and cultivation when they think themselves secure from their enemies. They have been unfortunate of late, and have had to beat a retreat from several fertile spots, owing no doubt to the straits the Masai have been put to, to gain a livelihood, which have emboldened their raiding propensities. They are great traders, and continually travelling to the coast with goats and cattle for sale.

Their religious ideas are vague. They have a belief in a supernatural power or powers, and certain large trees and notable rocks scattered over the country are identified with the power. The connection arises in this way. When rain fails some prominent tree or rock is selected as a place of sacrifice. If rain falls it is evident that that particular tree or rock is pleasing to the divine power, as similar offerings at other places have failed to obtain the desired effect. So the spot is endowed with a certain divine grace, and here the sick go to sacrifice for their recovery. One of our camps was inadvertently pitched on one such sacred spot, and the villagers would have nothing to do with us, expecting to find us all dead men next morning. However, as their anticipations were not realised, they followed the caravan on the march the next day to make up for lost time in the way of barter. We had some difficulty in persuading the Wa-Kamba at Nzoi to give us guides to the



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top of the hill, as they said their god lived there, and that often they had been driven back in terror by hearing supernatural and terrifying sounds. Said they at last, "We all know you are God's sons, and therefore He will not hurt you, so we will go." They believe in the efficacy of charms, and will erect an arch of bent sticks over a main pathway, from which will hang charms, generally one or two dead chickens to keep off the Masai.

The Wa-Kamba are advanced materialists, believing that as a tree grows up, flourishes and dies, so is the life of a man. They are not quite certain what to make of Europeans. Some say we are a cannibal race from the sea, others emanations of the divine power. In many villages they would not believe that we slept in our tents, but that we used these simply to prevent the common herd from seeing how we transported ourselves to the heavens, where they were convinced we slept among the stars. They explained our climbing hills and gazing at the sky through instruments, by the theory that we were searching for another road to the heavens. The sun, they believe, on setting, goes underground and sleeps; the waxing and waning of the moon are signs of the divine power's favour or displeasure. The stars, they quaintly observe, are so numerous that they do not know what to make of them.

As we leave Machako's and the mountains of Ulu, we see before us wide open grass plains with scarcely a bush or tree anywhere. These are the Athi plains, so called from several streams flowing north-east, which are the head waters of the Athi River. Away in the distance to the north-west, on a clear day, is visible a sharp outline of dark forest, the boundary of the Kikuyu country. These plains are a continuation of the great Kapite Plains stretching southward to the foot of Kilimanjaro. They are a sort of no man's land, and have been the scene of many a fight between the Wa-Kamba, the Wa-Kikuyu and El Masai, for they are generally all at enmity with each other. The Wa-Kamba, however, fight best in the hills, the Wa-Kikuyu in the dense forest, and the Masai in the open. Hence it is generally the Masai who graze their cattle and donkeys here till forced to move elsewhere by want of grass. Innumerable herds of game swarm on the plains, and the hippopotamus haunts the deep pools in the river-beds. The grass on these uplands is periodically burnt by the Wa-Kamba and Wa-Kikuyu, and then before the fresh grass sprouts, it is indeed a scene of black desolation. Even then the game swarms and is often more numerous than at other times of the year. These plains vary in altitude from 5000 to 6000 feet, and a perennial supply of water always exists in at least three of the main streams draining them. Rock outcrops are numerous, and frequent patches of lava-strewn ground denote a substratum of lava formation. Small swamps often occur where the rainfall is retained by rock close to the surface. The Athi River, which we have traced throughout its course, runs in a north-westerly direction to

the north of Donyo Sabuk or Chianjawi before turning to the south, and at the most northerly point in its course cannot be much more than 25 miles distant from the Tana River.

On these plains lions are always to be found. On one occasion twenty-three of these animals were seen together by Mr. Jackson; on another a caravan of twenty men was attacked by some fifteen lions, who played havoc with the loads thrown down by the porters.

Kikuyu is a wooded and mountainous district. It is a long but narrow strip of country, in width not exceeding 30 miles, and bounded on the west by the Kikuyu or Kinangop escarpment. At one time no doubt it was entirely covered by dense forest; but now so much has been cleared that the forest is almost confined to strips of 2 or 3 miles in width on either side. The country varies in elevation from 6000 to 8000 feet. It is a mass of long tapering spurs and narrow valleys, running generally from west to east. The flat tops of these spurs are often covered with clumps of forest, and in every valley rushes water. The scenery is varied and beautiful; at many places waterfalls are met with, which, though not of great size, are very attractive. Most of the streams rise in the swamps on the heights of Kikuyu escarpment, and form some of the head-waters of the Athi and Tana Rivers. The country is most fertile, and will produce anything. The grass and turf is as green and thick as on an English lawn, and has the same delightful springy feeling to the foot. Sugar-cane grows luxuriantly in the valleys; Indian corn, millet, and kimanga are much cultivated. In March, 1892, great havoc had been caused by locusts, but in August the second crop was very successful. English potatoes, peas, cabbages, tomatoes, beetroot, broad beans, cauliflower, and onions all do well, the rainfall being ample and the climate temperate. Everyone looks forward to reaching Kikuyu, if only on account of the excellent vegetables and delicious mutton with which you will be regaled at the Company's post of Fort Smith. The excellence of the grazing is proved by the condition of the cattle, sheep, and goats. The milk is excellent and sweet, as the vessels are kept clean. The timber is very fine and straight. Here in Fort Smith is the first house in East Africa built of burnt brick, and the cold is such as to render the fireplace quite a necessity to comfort.

The Wa-Kikuyu are allied to the Wa-Kamba; they are not, however, physically so well made. In character they are generally cruel and treacherous. Their neighbours, the Masai, complain of their twice having broken faith with regard to an old existing treaty, which allows the women of either race to trade with impunity, even when at war with each other. Masai women who have entered Kikuyu to buy food have been enslaved by the Wa-Kikuyu. The men are not so industrious as the Wa-Kamba; indeed, most of the work in the fields is done by women or women slaves.

The Kikuyu warrior is armed with spear and shield, sword, knoberry, bow and poisoned arrows; but he is not fond of fighting, except in dense forest or bush, where their poisoned arrows are used with great effect. Parties frequently go out to fight the Masai, but apparently never succeed in finding the enemy. The warriors dress their hair into a number of small ringlets resembling pieces of string, a custom also adopted by some of the Masai. Their villages are composed of round, dome-thatched huts with timbered walls and projecting eaves. They are generally built on a spur-top in a clearing surrounded by dense forest. The entrances are frequently most complicated, formed of interlaced timbers, through which you have to crawl. They can be closed at a moment's notice by logs always kept in readiness. Granaries are built similar to the huts on a smaller scale, with the floors raised 18 inches above the ground. Each wife of a M-Kikuyu possesses one of these granaries, and has to take her turn in providing her lord and master with food. Periodical dances are held, where both sexes unite, and at which large quantities of pombe, an intoxicating drink made either of honey or sugar-cane juice, are consumed. Honey is abundant, and collected by wild bees, which swarm in hollow tree-trunks suspended horizontally to the branches of large trees. These same bees are often a cause of grief to passing caravans, for the slightest noise provokes the bees to attack, and a general stampede of man and beast is the result. The life of a man is valued at from fifty to two hundred goats; that of a woman at from twenty to fifty. It is curious to note the various forms of oath deemed most sacred by different tribes in these countries. A Kikuyu man will swear on the blood of a goat, a Masai on a blade of grass, and a man of Kamasia or Baringo on a stream of running water. In each case the goat, the grass, and the water is considered their most valuable possession.

After two short marches from Fort Smith through alternate forest and open grass, you will emerge on the edge of the great eastern escarpment which is some 370 miles from the coast. This escarpment, which runs nearly north and south from beyond Lake Baringo to far south of Ngongo Bagas, varies much in altitude and in character. The heights are in places clothed with dense forest, where elephant roam at will, and again are grass-clad with numerous small swamps. The fall is not precipitous as one would imagine from the use of the word escarpment—indeed there are several points where loaded animals can descend without great difficulty. By the caravan road the highest point crossed is 7200 feet. The fall of 1400 feet is made up of two main steps of 700 and 500 feet respectively. Between these two steps the slope is more uniform, though in the centre is a smaller drop of 100 feet. The slopes of the hill-side vary from $\frac{1}{2}$ to $\frac{1}{10}$, and are in places rugged and much intersected by small watercourses. The soil is composed of broken masses of igneous rock and earth, and the ground is generally

clothed with a growth of jungle-forest with occasional patches of grass. Further north towards Baringo, where it is known as Lykipia escarpment, it is composed of two or three ranges of hills intersected by many deep ravines. Magnificent views may be obtained of the great rift and lakeland 2000 feet below you. Two remarkable features to be seen in this rift are the extinct volcanoes of Suswa and Longonot—the outlines of both their craters being distinctly visible. Immediately at your feet is the valley of the Kedong—a stream which rises in the escarpment some 10 miles north, and flowing southward loses itself in swamps below Ngongo Bagas. The fall into this valley shows a general gradient of about 1 in 23. After crossing this river the track runs up the valley through Masai grazing grounds, and thence rises over the shoulder of Longonot to a height of 7400 feet. Here in the middle of the meridional rift we are at a higher altitude than on the edge of the escarpment. The country is covered with thin bush or at times is quite open. From this saddle an easy descent of 8 miles takes us to the shores of Lake Naivasha, which is 6300 feet above the sea, and the same level as Kikuyu Post.

This country lying between the two great escarpments of Kikuyu and Mau is not an open long valley as might be supposed. It is undulating and even hilly in many parts, as many as four distinct waterpartings traverse it from west to east. It contains four lakes and innumerable small swamps. Of these lakes Baringo is the most northern. It is fresh-water and lies at an elevation of 3300 feet. By far the greater drainage of the meridional rift is into this lake, which like the remaining three has no outlet. Some 60 miles south lie the two smaller salt-water lakes of Nakuro and Elmenteita. These are at elevations of 6025 feet and 6250 feet, some 3000 feet higher than Lake Baringo. Lake Naivasha is the furthest south of the four, and is slightly larger than Baringo. The shores of Naivasha are shallow, and the extent of the belt of papyrus reeds is generally a good indication of the shoal of water, as they do not grow in water more than 3 feet deep. Two islets, one small, the second larger and something like a horseshoe in shape, are situate at the south-east end of the lake. Large masses of weed growing in water 4 or 5 feet deep have been mistaken by travellers for additional islands. We found the water close to these islands deepen suddenly, as if into a deep circular pit, two sides of which are formed by the precipitous shores of these islands. The water up to the edge of this pit was nowhere more than 8 or 10 feet deep; but once past the edge we could find no bottom with our limited line.

This seems to prove that the lake now occupies the position of an extinct crater. Down to the edge of the water grows green mossy grass, with an occasional clump of mimosa thorn. Duck of many kinds, geese and crane swarm on the shores of the lake, and the grass-lands are tenanted by zebra and several kinds of antelope. The small Lake

of Elmenteita is wooded and rock-bound on the east, but comparatively bare on the west shores. Nakuro is surrounded by low bare hills covered with scanty grass. Between Nakuro and Baringo the country is undulating, in places covered with thorn scrub, elsewhere with long tangled grass. A noticeable feature is a succession of long rocky ridges, flat-topped, which run north and south. At two points warm springs are met with; the temperature of these is, however, not great, and never exceeds 95°. The shores of Baringo are swampy in many places, and surrounded with a thick growth of wait-a-bit thorn and flat-topped acacia trees. In the centre of the lake is a group of five islands—the largest of which is inhabited by Wa-Kwafi. Masai are generally to be found grazing their cattle to the north of Elmenteita and round Naivasha, moving from one to the other as the pasture gives out.

All this country, lying in the great meridional rift south of Lake Baringo, is one of the haunts of the Masai, kraals of whom are always to be found either round Elmenteita or Naivasha. So much, however, has already been written by other travellers on this race of warriors, that I only propose alluding to some of the changes that have taken place in their behaviour and manners. Formerly arrogant in the extreme in their dealings with Swahilis and Europeans alike, insisting on the due payment of hongo or toll as their right from every passing caravan, they have changed, and very much so, for the better. They regard a European with respect; they no longer force their way into his tent and ask him to take off his boots and show his toes. They credit him with supernatural power, and would never seek to delay him for purposes of their own. When a caravan camps near Masai kraals, a deputation of warriors with a Lygonani or captain and chief medicine man waits upon the leader of the caravan. They greet him courteously, ask whence he comes and whither he goes, what is his object, and what tribes he has passed through. They will then proceed to ask for a gift—not demand it—and longing eyes will be cast on any cattle with the caravan. Not succeeding in their request, the Lygonani will ask for medicine or charms by which he may be fortunate in his cattle-raiding, and failing in this he will say, "Well, at all events, you have travelled far and must have seen many cattle, tell us where you saw the most, so that we shall know where to go for them." When you describe a country where cattle are in numbers like blades of grass, "Tell us where it is," they will eagerly ask; and it is amusing to see the abstracted look on their faces when they learn it is the Suk country, for hitherto the Wa-Suk have proved too hard a nut for them to crack. Should any disturbance arise between the porters and the young Masai, a word to the Lygonani and the cause of complaint is at once rectified. They still despise the Swahili; but even they have in great part lost their terror of the once-dreaded Masai. No doubt their fallen estate is partly the cause of this change of bearing.



VIEW IN SOTIK.

Formerly the possessors of countless herds of cattle, sheep and goats, the disease, a species of lung ailment, has so reduced their flocks that where there was once plenty in the land, many—even Elmoran or warriors—have been and are reduced to eating the once-despised Kikuyu and Kamasia flour. Once they would eat nothing but beef or mutton; now they will accept with avidity the refuse of a carcass of even a zebra or antelope. Naturally this state of things has not reduced their raiding propensities, but it has made them more amenable to reason and lessened their pride. The Elmoru, or married people and children, are worst off; they are often met with in a starving condition, while whatever food is available is always at the disposal of the young warriors. On account of this want of food Masai children are often sold to Swahili caravans, others run away and of their free will throw in their lot with the porters, who to their credit generally treat them well and share with them their scanty portion of food. It is believed that a beginning might now be made if only proper steps were taken, and the right men got hold of, to secure the goodwill of these warlike wanderers, and to secure their assent to some scheme by which use could be made of their discipline and soldier-like qualities. Unfortunately little or nothing is known of them, and no attempt has hitherto been made to provide them with a sphere in life other than that of marauding. It is, however, known that they are willing to make treaties with the European, and it is also believed that they would abide by any such treaty they made.

The Mau escarpment on the western side of the lakeland is a much more serious obstacle than that of Kikuyu. It is not, however, a single well-defined mountain range, but rather a mass of hills, with narrow steep ravines running in every direction till they find an outlet down to one or other of the lakes. It has generally a higher altitude than that on the Kikuyu side. West of Naivasha one track crosses an elevation of 10,100 feet, and away northward the actual elevation gradually decreases, though as the great trough similarly has a fall of 3000 feet to Baringo, the actual climb is as great, or nearly so. West of Baringo the escarpment is split into two great ranges of Kamasia and Elgeyo. On Kamasia the route crosses an altitude of 6800 feet, into the valley of the river Ndo, you descend to 3600 feet, and then after a precipitous climb through lava cliffs the summit of Elgeyo, 7700 feet high, is reached. Between these two northern and southern routes an easier ascent from north of Lake Nakuro is obtained. From a level of about 6500 feet, the highest point of the escarpment, 8800 feet, is reached in 75 miles, though many ravines and water-courses have to be crossed, which pour their waters into Lake Baringo. By this road the escarpment is surmounted just south of the point where the two frowning ranges of Elgeyo and Kamasia diverge from the main range.

Let me now describe the most southern of these routes, which is perhaps the least known of the three. This route, known as the

"Sotik" route, passes through Sotik, Lumbwa and South Kavirondo to Ugowe Bay in the Victoria Nyanza. Passing along the southern shores of Lake Naivasha, through beautiful grass country with occasional clumps of thorn forest, where guinea-fowl swarm, we camp amongst some low, outlying, rocky hills forming the western shores of the lake. Right in front tower the forest-clad heights of Mau. A Masai cattle-track slants up the hill-side, and resembles a well-cut road, though in reality it has been worn so from time immemorial by the hoofs of countless cattle. The lower slopes of the hill are covered with bush and open grass glades. Where this road crosses there are two main ranges the lower of which has a height of 8900 feet, and is separated from the higher by an open grass valley running southward. The secondary range has an altitude of 10,100 feet above the sea, and 3800 feet above Lake Naivasha. The crests of these two ranges are clothed with dense forest and undergrowth. From every branch hang streamers of moss and grey lichens, tree ferns revel in the damp atmosphere, and everywhere is a great silence. Indeed on these heights few living things are to be seen—the track of a fox or hyena, or the occasional footpad of a leopard. An indistinct twilight prevails under the hoary old junipers, among which the wind sighs sadly. It is indeed a "forest primeval," a mass of decaying vegetation, of moss-grown trees and long rank grass. The hill sides are composed of tuffs and volcanic debris, the higher range of softer soil, with but few traces of rock. The ascent is steep—to the lower range the section shows a rise of 2200 feet in 5 miles, while the higher range is reached by a climb of 900 feet in about 1100 yards. From the summit a glorious view is obtainable of Naivasha and the volcanic cones surrounding it. It is chilly, even very cold at nights on these heights. The atmosphere is damp, and seldom before nine o'clock does the sun succeed in dispersing the dense grey mist, which, hanging like a pall on forest and grass, drenches you as effectually as heavy rain.

At this point the forest is but of small extent; after marching $1\frac{1}{4}$ miles from the summit, the track emerges on to open grass, and a fine view to the westward is obtained. At first sight you would describe the country as rolling. It is a series of long narrow spurs separated by ravines. These spurs and ravines slope away gently to the south and south-west, lying outstretched like the fingers of a giant's hand, and culminating in a series of heights rising to the north of where you stand. The forest we have passed through has a much greater width northwards, as the dark line on the horizon denotes. But this open grass country is very deceptive. The ravines you will see are far deeper than appeared at first sight, and at the bottom of each is dense juniper forest. The spur-tops are generally open long grass. Marching westward, the first camp is at the bottom of a ravine with a descent of 1300 feet in 5 miles. Thence onwards for eight or nine marches, the section

will show an average rise and fall each day of 1200 feet. From the summit of Mau to a point on the same level as Naivasha, two ravines over 600 feet deep are crossed, four are over 400 feet, and four over 300 feet. Indeed, from the general slope of the country, all the drainage from the heights of Mau has to be crossed on our westward march, and there is no possibility of evading these. A somewhat more northerly route by Mr. Jackson and Mr. Gedge shows the same drainage crossed, though naturally the ravines are not so deep they are very much more numerous. Further to the south are large tracts of forest through which we have to plunge. A guide is very necessary to travel over this road, as although wherever there is forest or bush the path is easy to find and keep to, in the open country there is little or no vestige of road through the long grass, and if on entering the next patch of forest we did not strike the path again, we should be hopelessly lost and have to cut our way at a very slow rate of speed. I know nothing more tiring than this cutting one's way through interminable forests and bush, especially over swampy ground in wet weather. Even where the path is followed in the rains through these forests our average rate of speed was often not more than a quarter of a mile an hour. The path has never been properly cleared, so that the branches hang very low and obstruct the porters; twisted tree trunks and roots traverse the way in every direction, like a Brogdinagian matting, and the interstices are filled with muddy slush, the ascents and descents often precipitous, and the streams, though seldom deeper than 3 feet, are very rapid and dangerous to cross. For eight days marching from the top of Mau no living being is seen except an occasional band of Wandorobbo hunters. Formerly these spurs and valleys were occupied by the Wa-Kwafi, at one time a numerous and powerful section of the Masai, and like them rich in cattle, sheep, and goats. But they have been almost exterminated by the Masai, and but few of them are to be met round the southern shores of Lake Baringo, where they now make their livelihood by agriculture. Traces of their occupation are, however, numerous, in the long-deserted remains of kraals, and the blackened juniper stumps which remain still standing as evidence of their yearly grass fires. There is fine grazing throughout, clover and food grasses grow luxuriantly; but the timber as a rule is not of much value. The English bracken fern grows in profusion from a level of 8200 feet downwards; but we did not see it at higher altitudes. The climate is almost European—cold and bracing at nights, and not unpleasantly warm in the sun. Throughout this distance of 75 miles from Mau the soil is composed of purple lavas, volcanic mud, ash, and tuffs resting on quartzite and gneiss; and the volcanic overflow seems generally to extend for this distance and no further, though traces are to be found further west of volcanic rock. By road we are now 100 miles from Naivasha and about 500 miles from the coast.

The Wandorobbo, who may occasionally be seen in this otherwise deserted country, are a small tribe much scattered, and to be found generally only in the pathless forests. They are very shy and cautious in their dealings with a caravan, perhaps from fear of the Masai, who are their masters to a certain extent. Swahilis can only obtain communication with these dwellers of the forests by following them to their villages in small numbers and with great precaution. They, the Wandorobbo, are skilled hunters, and their livelihood depends on their success in the chase. They never cultivate the land, nor keep flocks. Their villages are generally very small and difficult to find. They barter the ivory they obtain from elephants for beads and wire, and subsist on the flesh of every sort of animal they kill, from the elephant to the antelope. They are armed with the bow and poisoned arrows, and a peculiar heavy-headed spear 7 or 8 feet long, the head of which is poisoned, and being loosely fastened is easily detached. They manufacture for the Masai their buffalo-hide shields, and often act as intermediaries between them and the Wakikuyu in the purchase of food. The language is a dialect of the Masai, and very similar to it.

Passing through this deserted forest and grass country, we saw little or no game except rhinoceros. But apparently during the dry season hartebeest, eland, wildebeeste, and various sorts of antelope are to be found in numbers, and formerly large herds of buffalo. Here I may mention that throughout the expedition no member of the Survey party was fortunate enough to see a single buffalo, and only on two occasions were tracks of this animal met with—in one instance near the top of Elgeyo, and again just before entering Sotik. Wa-Kwafi and Masai I have questioned again and again assert that none are now to be found. Rhinoceros on the other hand are found in large numbers; on one march between the hills of Sotik and the River Niro we counted twenty of these huge animals, and no doubt there were many more, as the leading porters in two instances nearly marched over three of these animals as they lay asleep in the long grass; and for many days afterwards rhinoceros meat, not always very fresh, was the staple food of the caravan.

Sotik is a very hilly, almost mountainous, country, composed of ranges of hills running in a north and south direction. There are two main ranges of hills known as Likuto and Elmilan, and they form, as far as one could judge, a water parting between the drainage into Lake Victoria Nyanza, and that just crossed which appears to flow in a southerly direction towards German territory. It is difficult to speak with authority on this point, as the forest growth is so dense, and the view during the rains generally so cloudy that an accurate opinion is difficult to form. But if this is not the case, and the drainage of such streams as the Savmei, Na Erok, and Niro, finds its way into the Victoria Nyanza, it must be by a very circuitous route through German

territory and not by the Kosove Valley, through which the drainage of Sotik and Lumbwa falls into Ugowe Bay. These hills of Sotik are of crystalline formation generally, and numerous outcrops of gneiss and schist will be observed on the route. I may mention here that the route followed by the Railway Survey party through Sotik and Lumbwa was that first traversed by Major Eric Smith and Mr. Neumann of the I.B.E.A. Company's service. No inhabitants are met with on this first march, the track passing through dense forest growth; amongst the juniper and mimosa trees are to be found specimens of cedar, though of no great size. The Lkonono, a large rapid stream, 70 or 80 feet wide and 3 or 4 feet deep, is crossed, and the track throughout is exceedingly bad, the soil being black adhesive clay, and constant cutting was necessary to enable the loaded porters to get through the forest. Two days more marching brought us to the further edge of Sotik. The country is more open, large clearings on the hill-tops and sides of the valleys denoting extensive cultivation. The track crosses and re-crosses several mountain torrents, the principal being known as the Enumnuntungi River, and the valleys have steep sides and in direction are very erratic. Villages composed of clusters of from two to four huts generally are built on the hill-tops in the centres of clearings, and as a rule have no enclosure or wall of any sort. The clearing of the forest is done in a way similar to that practised by the Wa-Kikuyu and Wa-Kamasia. The undergrowth and jungle is cut away by hand, and a fire lighted round the stumps of all the larger trees, which, after their fall, are left to cumber the ground and decay away, only the small undergrowth being dug up. Sometimes the trees are cut down by hand and the whole network of undergrowth and branches left for a year to dry, and the whole mass is then set fire to; but the tree-stumps are always left in the soil; it being considered less trouble to clear more ground than to uproot these. In the centre of this Sotik country we came across a caravan of Swahili traders belonging to Jumbe Kimameta, who had established themselves in a strong palisaded camp, and were engaged in the purchase of ivory. This is the custom of these Swahilis to establish a strong head-quarter camp, and send out parties of men into the surrounding country to barter their trades goods for ivory. It is a long operation, as often a whole week is taken up in the purchase of one tusk, and the business is one requiring an infinite amount of patience. In some instances, such as the Nandi country lying to the north of Sotik and Lumbwa, the Swahilis have to trust the Wa-Sotik and Wandorobbo with trades goods and send them to purchase the ivory, as the Wa-Nandi will not allow the Swahilis into their country. Whilst these parties are out the remainder in camp purchase food for their return and pass an ideally lazy existence. The Wa-Sotik cultivate apparently nothing but whimbi, a cereal with a very small, round, dark-brown seed, which is easily converted into flour

and is not unpalatable. Very excellent and cheap honey is obtainable in large quantities. The Wa-Sotik possess cattle in small numbers, and large herds of sheep and goats, which find excellent pasture all the year round. The soil is apparently extremely fertile. As the people of Sotik, Lumbwa, and Burgani, are all closely allied, I propose speaking of them together.

The country of Lumbwa is not so mountainous, and almost entirely free of forest. It is generally similar to what I have described between Mau and Sotik, a series of ridges and ravines. The ravines are, however, not so deep, and the ridges are almost flat-topped. It is extremely well-watered by many large streams. Of these we had to bridge one, the River Enumnutungi, forming the boundary of Sotik and Lumbwa, and were preparing to bridge another when we fortunately found an existing native bridge of which we availed ourselves. Many of the valleys are so flat that the water forms a series of swamps sometimes 200 yards broad; these swamps being connected by rapid streams, this tends to show that the rock formation is a succession of horizontal strata in the form of steps. The country is covered with rough scrub, bracken-fern, and patches of open grass. Red and white clover grows luxuriantly, and the pasture is of the finest description. Large flat-topped acacia thorn trees are studded all over the country, but no other trees of any size. Further north, for we are now moving in a due north direction from Sotik, the country is quite open, and few or no thorn-trees are to be seen. Three marches take us to the borders of Burgani on the River Kivitoi. The country of Lumbwa is populous, much more so than Sotik, and it is surprising how the inhabitants can spare sufficient food to sell to caravans, as the cultivation does not seem correspondingly greater. Whimbi (*Elusine*) again is almost the only cereal cultivated, though small patches of mtama sorgum are to be seen. Pumpkins are grown in large quantities, and some few ground nuts were brought in for sale. Large herds of sheep and goats grow fat on the fine pasture, and cattle in considerable numbers are kept. The rainfall must be very considerable; from our experience I should estimate it as 50 to 60 inches a year. The cultivated fields are generally enclosed by a thorn boma or rough fence.

The country of Burgani presents the same physical configuration as Lumbwa, a series of valleys and ridges, till a high plateau is reached overlooking the valley of the Nyando River in South Kavirondo. But instead of the flat-topped acacia trees which are a noticeable feature in Lumbwa, the country is almost bare of shrub or tree. Thick bracken scrub and grass, for the first time since leaving Naivasha euphorbia growth is seen, and in one or two places the pleasant green patch recognisable from afar as a banana grove. Patches of whimbi cultivation, more extensive to the north than southward, and numerous villages denote a fairly large population. The strata are of schist and quartzite, overlain

sometimes by volcanic ash, and again by red clay. It is a country of even smaller extent than Sotik or Lumbwa, as one can traverse its width in two average marches. The high plateau referred to is covered with 8-foot elephant grass, and from this vantage ground we obtained our first view of the great lake. It was a dull day, and the nearest shores were 20 miles distant and 2000 feet below us, so that this first view of the inland sea was not very impressing—only a dull, grey level patch under the horizon, but the porters greeted it with shouts of “Nyanja, Nyanja tena,” and brightened up wonderfully at the thought of being so near the flesh-pots of Kavirondo and Usoga. The fall from this tableland is steep and precipitous, and the going very bad. There is no path and the hillsides are covered with long tangled grass, in which lurk unseen loose stones and boulders of all sizes, which are a cause of infinite grief to the heavy laden men, so that much relief was experienced on gaining a valley in which a tolerably good path led us into camp. The fall is 1400 feet in 6 miles, the worst piece of the descent being one of 650 feet in 2 miles. Here in camp, at the foot of the Burgani plateau, we are on the borders of S. Kavirondo, by road 160 miles from Naivasha, and some 560 miles from the coast.

The people of Sotik, Lumbwa, and Burgani, and those also of Nandi, an inhospitable mountainous district lying to the north-east of Burgani, are all nearly allied. In appearance they resemble the Masai more than any other of the tribes we have passed through, and do not belong to the Bantu family. Of shorter stature than the Masai, the men and women are models of symmetry and grace. Indeed we considered them physically the best-proportioned types of East African savage we met. The faces of both men and women are well-formed and pleasing, and they do not wear the truculent and ferocious expression adopted by the Masai; but like all savage tribes the women age rapidly and lose their good looks. They have a bad reputation for thieving and treachery, and in one instance after leading a caravan on a wrong road attacked them by night. But throughout our march they gave us little or no trouble, except in a single case where they tried to extort payment for guides before these had done their work. At several places they were exceedingly friendly, and it was no uncommon thing to see loads being brought into camp by Wa-Lumbwa or Wa-Burgani who had struck up a friendship with the porters *en route*. They willingly brought in flour and honey for sale, and the Swahili were constantly joining in their dances and merriment. Through the Nandi country no caravan has penetrated; twice Swahili caravans have tried but have experienced so much opposition that they have had to beat a very discomfited retreat. They are the terror of their neighbours in South Kavirondo, and are constantly harrying and raiding them, and the Wa-Nandi are even treated with much respect by the redoubtable Masai. The language of all these peoples is a dialect of the Masai tongue, and

this latter is generally understood amongst them. No doubt formerly, and to some extent even now, Swahili caravans are accustomed to carry off children as slaves from the Lumbwa and Wa-Burgani, for several times on the line of march we would come across a large body of men sitting down in full war-paint on some commanding open space near a village, and in reply to our question of what they were doing, the answer was, "We are taking care you don't carry off our young men and women." The men wear a cape over their shoulders of colobus monkey or mole skin, and often a large spade-shaped piece of goat skin hung round their waists from behind; but many go quite as nature made them. They affect necklets of iron wire and iron chain, and wear coils of iron wire round their arms and legs. They are armed with a spear, and sometimes bow and arrow; but these latter, as far as we could judge, were not nearly so common as reported. Many of their spears are of Masai manufacture and shields also. These Masai shields and spears they obtain from Swahili traders in exchange for ivory, a large trade being done in this line. They are fond of daubing themselves with red clay from head to foot after the fashion of the Masai. The women wear a distinctive dress according as they are married or unmarried after the custom of the Wa-Kamba, and are fond of iron wire, iron chain, and black bead ornaments. The married women allow their hair to grow into the scrubbing-brush appearance adopted by the Masai women and others. They are very fond of ear ornaments, and extend the holes in their ears by using successively larger round pieces of wood—sometimes a single long piece of wood is thrust through the lobes of both ears at the back of the neck.

They are very superstitious, and regard anything they do not understand with great terror, such as fireworks or a burning-glass. At one place we were confronted with six men who wore hideous masks, half their bodies being concealed by a large curtain of loose fibres hung on a yoke-like stick fastened above the mask, who were extremely astonished that we did not at once turn tail and bolt in terror caused by their appearance. It is amusing to see the men greet each other in the English fashion by shaking hands, and to see a man and his sweetheart walking about with their arms entwined round each other's waists. We noticed only one lame boy, and not a single mis-shaped man, woman, or child throughout the country.

The climate is very salubrious and equable, the altitude varying from 6000 to 7500 feet. As I have mentioned little else is grown but whimbi, which is the staple article of food, but as few caravans pass through these countries, the people have but little inducement to make more use of the generous soil and fine rainfall they are blessed with. The grazing is really magnificent, and from all accounts is perennial.

In the camp at the foot of the Burgani plateau our four guides from Lumbwa deserted, without even so much as waiting for their present.

This we were greatly astonished at, and could not understand the reason till the next day, for they were on the borders of their own country and protected by a caravan. However, we found out subsequently that these guides were implicated in an attack and raid lately made on a Kavirondo village, and were afraid to even spend a night within 10 miles of their enemies, so decamped immediately without waiting for payment. A tiresome march up on to another ridge through long grass and loose boulders, and we could see the large Katch kraals away in the valley below us. These were hailed with delight, for we thought of the fowls and eggs, Indian corn and sweet potatoes we should once more be able to purchase; but we were doomed to disappointment. As we descended into the level grass valley, we passed through fields choked with weeds, and an unwonted silence met us instead of the cheery shouts of welcome and friendship we had been looking forward to. Nearer and nearer we approached to the huge villages, and not a soul was to be seen—no grazing herds or a sign of life anywhere—all were deserted! It was a blow, as we had hoped to replenish our stock of food, now well-nigh exhausted. These kraals are of enormous size—indeed, nowhere did we see such a number of huts in a single enclosure. A dry stone wall some 8 feet high surrounds each village, the entrance through a doorway with a wooden lintel overhead. Inside the walls all the huts were standing, round in plan with grass dome-shaped roofs, the walls sometimes made of mud, or of stone and mud. Domestic utensils of all sorts lay scattered about amongst the weeds, and signs everywhere of an unpremeditated flight. A small stream known as the Katch River flows through the valley, which is much strewn with loose stones of all sizes, the soil being generally of the description known as black cotton. We camped some 2 or 3 miles beyond these deserted villages in bush country, and at last came across a strange creature who was looking after some goats. He told us that one night some six months before the people of Lumbwa and Burgani had attacked the Katch kraals, carried off all the cattle, sheep and goats, and in many cases closed up the entrances to the huts, the inmates being asleep, and set fire to them. The Wakavirondo apparently were completely taken by surprise, and made no attempt of any sort at resistance. Many men, women, and children were killed, and those that had escaped had gone westward to the shores of the lake. The man told us there were some small villages in the bush near, and eventually we managed to get a little flour, and, what was very delightful, some fresh milk. I should estimate that the Katch kraals must have contained at one time at least 5000 inhabitants. The next day we marched across an open swampy plain, with numerous villages, to the west, the people accompanying us on the march and showing everywhere most friendly intentions. Through this plain flows the Nyando River into Ugowe Bay; this river in May is some 60 yards wide and from 4 to 6 feet deep, with a current of about 4 miles, so that we had

some difficulty in getting across. The waters of the Nyando come from the Nandi hills to the north-east, and from the uplands of Burgani and Lumbwa to the south-east. It is curious in that it apparently changes its course occasionally in flood-time, as subsequently two former beds, now almost dry, were pointed out to us by the natives. To the north and north-east of this fine open valley rise the rugged hills of Tiriki and Nandi, and to the south-east and south those of Lumbwa and Burgani. The valley lies at an elevation of from 3900 to 4300 feet above the sea, the Nandi Hills having a height of from 2000 to 3000 feet above the plain. Along the right bank of the river are numerous villages and magnificent cultivation. Here the Wa-Kavirondo villages are generally surrounded by a high enclosure of euphorbia, and no more do we find stony ground but rich alluvial deposits of loam and clay soil.

The mtama cultivation is the finest I have seen anywhere. Much of it is 12 and 14 feet high, and marching through it you will be astonished at the fertility of the soil that produces such a growth. In addition to mtama cultivation there are masses of mahindi and whimbi, many different sorts of pea and bean, sweet potatoes and mahogo (cassava), pumpkins in profusion, and further to the north-west bananas. The natives swarm into camp with fowls and eggs, fish and goats for sale; and the Swahili porter is in a veritable land of milk and honey. As usual in such cases, he overeats himself, always wishes to halt and eat more, and withal is entirely contented. The head chief of these parts—Kitoto by name—sent his two brothers and his son with a present of a sheep and a goat; he himself was engaged in building a new house, and could not come. A return present of brass wire and white beads was much appreciated. Thence to the shores of the lake at Ugowe Bay we passed through the same rich soil and cultivation, portions of the march during the rains being somewhat swampy from the flat character of the country. The eastern portion of Ugowe Bay is very shallow, so much so that we were told by Wa-Kavirondo that round the mouth of the Nyando you could walk for several miles before reaching water 6 feet deep. The water on the northern shores of the bay is deeper. The growth of papyrus is generally a very good indication of the extent of shoal water. The papyrus does not appear to grow in water more than 4 feet deep; and according as the belt of growth widens or narrows, it will generally be found that the water shoals slowly or rapidly. We launched our 12-foot Berthon boat on the bay, and took many soundings round the coast, and eventually found one reach of the shore where a depth of 6 feet of water was found at 20 to 30 yards from the water's edge, and a suitable landing-place and anchorage for light draught steamers. From many inquiries made of the Wa-Kavirondo fishermen on the shores of the bay it appears that the water is always higher in the evening than in the morning, generally from 3 to 6 inches. This is no doubt caused by the evening lake breeze, which never blows at night

or in the early morning. They further told us that the maximum rise and fall of the water was about 2 feet, which would be caused partly by a strong wind, and partly by much rain. This maximum rise and fall was of rare occurrence. Crocodile and hippopotami swarm in the lake, and at least four different varieties of excellent fish; but, curiously, there are not many duck or geese to be seen on the water, though divers are common. The Wa-Kavirondo are skilled fishermen, using draw-nets and floats, weirs and baskets with much success. Indeed, throughout the country there are recognised market-places, some 10 miles from the shores of the lake, whither long strings of men, women, and children every day carry their baskets of fish, and barter them for bananas, mtama flour, and other produce. Marching northward from Ugowe Bay, the country is hilly, and its physical features somewhat similar to those of Kikuyu—ridge and valley, with numerous large streams which rise from the hills of Tiriki and the tableland of Nandi. Most of the country between Ugowe Bay and the Nzoia Valley is profusely cultivated and thickly populated. The villages are sometimes surrounded by a mud wall and deep V-shaped ditch outside, which is used as a reservoir for water, and sometimes simply concealed in a patch of high elephant grass, and entirely lost to view. Further northward we noticed numerous villages and no signs of fields or cultivation anywhere. On asking the reason of this they said that elephant were numerous to the east of their villages, and at night came down and destroyed their fields, so that they had been obliged to cultivate land further to the west, 5 miles off. Many of the streams are bridged very cleverly by suspension bridges made of tree creepers fastened from tree to tree on either side; but they are not very strong, and we were generally obliged to use our boat to ferry the loads over.

The people of Kavirondo are deserving of some notice. Their appearance and get-up has been described by Captain Lugard, and their total disregard of clothes. Physically they are tall, but often ill-made for their height, with no chest or limb development corresponding to their stature. They have the negro type of face, with large mouth, thick, protruding lips, and prognathous jaws. They are not a warlike race. Their spears have very long shafts and small, badly-fastened iron heads, which are nearly always rusty and dirty; their shields also are ill-shaped and ill-made. As a rule, they carry no weapons of any sort, but a pointed stick; and when once they have ascertained that a caravan has no ill intentions, they swarm into the camp entirely unarmed and unclothed, and show most friendly feeling. I am speaking more particularly of the people of South Kavirondo, which is less known than North Kavirondo. Mr. Jackson reports these people to have been treacherous and great thieves; but if this was the case in 1889-1890, they have much improved for the better. They are apparently hard-working and industrious. According to their proximity

or otherwise to the lake, they are either fishermen by trade or agriculturists. The highly-cultivated and well-cared-for fields denote a knowledge of agriculture and industrial habits that compare favourably with other savage tribes. They are very ingenious and clever in making basket-work, and ensnaring quail and other small birds, and, as has been mentioned, are highly skilled in the use of the fish-net and basket. They have fine herds of cattle, sheep, and goats, but have no encouragement to increase their flocks, which are always a great attraction to their more warlike neighbours of Nandi and Lumbwa. This is the case throughout East Africa. A want of protection from stronger and better armed rivals is a great deterrent to the increase of cattle in a weaker and more peaceable district; the possession of cattle is generally merely an advertisement for a raid. In North Kavirondo, along the shores of the lake, between the mouths of the Sio and Nzoia Rivers, the people are skilful in smelting iron ore brought from the hills of Samia. From the iron they make iron wire, spears, hoes, and numerous other small implements; and it is curious to observe that similarly to the silver-workers in India, this ironware trade descends in families from father to son.

The Nzoia River, which with its tributaries drains the upland plateaux of Nandi, Elgeyo, and Kabras, is perhaps the second in point of size of the streams that feed the Lake Victoria Nyanza. It has formed for itself a small delta at its mouth, through which the waters wind their way in numerous channels to join those of the lake. The drainage from Mt. Elgon does not join the Nzoia River or flow into the Lake Victoria but goes direct to the Nile.

It will be unnecessary for me to add more to this paper on the subject of the fertile countries of Usoga and Uganda, as these have been lately described. Nor is there space to touch upon the other routes which have been traversed by the Railway Survey parties.

With regard to the relations between the Survey parties and the various tribes, it may be well to state that, notwithstanding prognostications to the opposite effect, these were friendly throughout the work, and that it was never found necessary to use firearms except to repel the inquisitiveness of rhinoceroses, or in the pursuit of game for the pot.

In conclusion I would say that Captain Macdonald, who is now in Uganda, was the leader of the expedition till near the close of the field-work. It is due to him that the Survey operations have been successfully carried out. I am indebted to him for notes on many points of interest, which I have made use of in this paper.

THE ANCIENT TRADE ROUTE ACROSS ETHIOPIA.

By J. THEODORE BENT.

ADULIS, the modern Zula, was the port of one of the great trade routes which led into the interior and eventually came into the Nile valley at Meroe. It is about 20 miles south of Massawa on the Red Sea, about 2 miles from the shore, and is represented now by a number of mounds covering buildings which have been hidden by the accumulation of soil washed down by the adjacent river, which is now entirely silted up. The few traces of architecture still to be seen point to a late period, probably not more than a century before Christ. As for the great Adulitan inscription, it has long since disappeared, and probably lies buried in one of the mounds. Luckily for us, it was copied and its authenticity is undoubted, and it forms one of the most valuable aids we have in deciphering the ancient geography of Abyssinia.

Ancient geographers are scanty in their information about this part of the world. Strabo knew nothing of Adulis. Pliny knew it as the emporium for ivory, skins and products of the interior, and the port of Ethiopia Troglodytica. The author of the 'Periplus' was better informed, and knew also that Adulis was the port of Axum, the capital of this portion of Ethiopia.

Both Ptolemy and the 'Periplus' mention the town of Koloe as the first place inland after Adulis; the 'Periplus' tells us that it is three days from Adulis and five from Axsum. Lejean imagined that it therefore must be near Halai, the first village on the high plateau on the road to Axum. Salt considered Dixan to be the spot, distant about three hours from Halai. When we visited these villages I searched everywhere for ruins, but found none. However, at Halai we heard of extensive ruins on a high and isolated plateau called Kohaito, so we determined to pay them a visit; and there can be no doubt that these ruins mark the site of the old town of Koloe, for they are very extensive and exactly where they ought to be, namely, three days from Adulis and five from Axum, and there are no others within an area of many miles.

The high plateau of Kohaito is a very curious formation, being a long isolated mountain with a flat top like Table Mountain, 7000 feet above the Red Sea. It is most difficult to ascend, being surrounded by precipices; but the way by which we approached at the southern end, and the way by which we descended about half-way down the western side, offer ample traces of old roadways. In difficult places the rocks have been cut; walls of sustentation are visible at many points; but boulders have fallen and trees grown up, which make the ascent now exceedingly arduous. The ancient ruins are exactly in the centre of the high plateau, by the side of a stream, which has eaten away a curious low valley right down

question of "Ship-money" in the reign of Charles I. Our knowledge of the Dutch wars of the XVIIth century is, at present, extremely imperfect; the Histories of the French wars during the reigns of William III and Anne are chiefly noticeable for their omissions, blunders, and confusion; and our Histories of the wars of the XVIIIth century are, at best, clumsy and inaccurate compilations, whose authors had at their disposal no trustworthy information beyond the very little which a reticent government saw fit to put in the Gazette. Hence it is that the action of our navy, in some of the most critical passages of our history, has been much misrepresented and misunderstood. It is hoped that the Navy Records Society may be able to remedy this great defect in the story of our national life, by printing and publishing such authentic accounts of past events as were recorded at the time, either by veritable actors in them, or by others who were in a position to have exact information. Of such accounts there are, in the Public Record Office, hundreds and hundreds, absolutely unknown, except to a very small body of experts; there are hundreds and hundreds in the British Museum; and there is a countless number in private collections throughout the country, some of which have been mentioned in the several Reports of the Historical MSS. Commission, many of which are, as yet quite unknown. It will be the principal and most important part of the business of the Society to bring these to light.

But, again, every one who has paid any attention to the subject, knows how curiously ignorant we are as to the social life or social status of our forefathers in the navy. We do not know where or how they lived, messed or dressed; and the fact that a large proportion of our officers entered the service as "Captain's Servants" has been, over and over again, put forward as a proof that they were, for the most part, men of low origin. It is confidently believed that the publication of journals and letters of the XVIIth or XVIIIth century will clear away much of this darkness; and the Council has grounds for hoping that the present owners of such journals, or such letters, will be ready to co-operate with the Society in this endeavour.

Among the MSS. and rare printed books already suggested to the Council are:—The letters of Lord Howard and others in 1587–8; Boteler's *Six Dialogues about Sea Services between an High Admiral and a Captain at Sea*, written probably about 1630, but published in a garbled form in 1685; Monson's *Naval Tracts*, written about 1640, and printed, also in a garbled form, in Churchill's Collection of Voyages; the letters of Blake and others during the Dutch and Spanish wars, 1652–7; letters from the Mediterranean Squadron during the first Dutch war, 1652–3, the substance of some of which was published in two angry pamphlets by Appleton and Badiley in 1653; the private journal and other papers of Captain Stephen Martin, in the time of William III. and Anne; the letters of Sir Samuel, afterwards Lord Hood, from the West Indies, 1780–3; and the private journal of Rear-Admiral Bartholomew James, 1765–99. Some of these will most probably be among the earlier works issued by the Society.

Any person wishing to become a Member of the Society is requested to apply to the Secretary, who will submit his name to the Council. The Annual Subscription is One Guinea, the payment of which entitles the Member to receive one copy of all works issued by the Society for that year.

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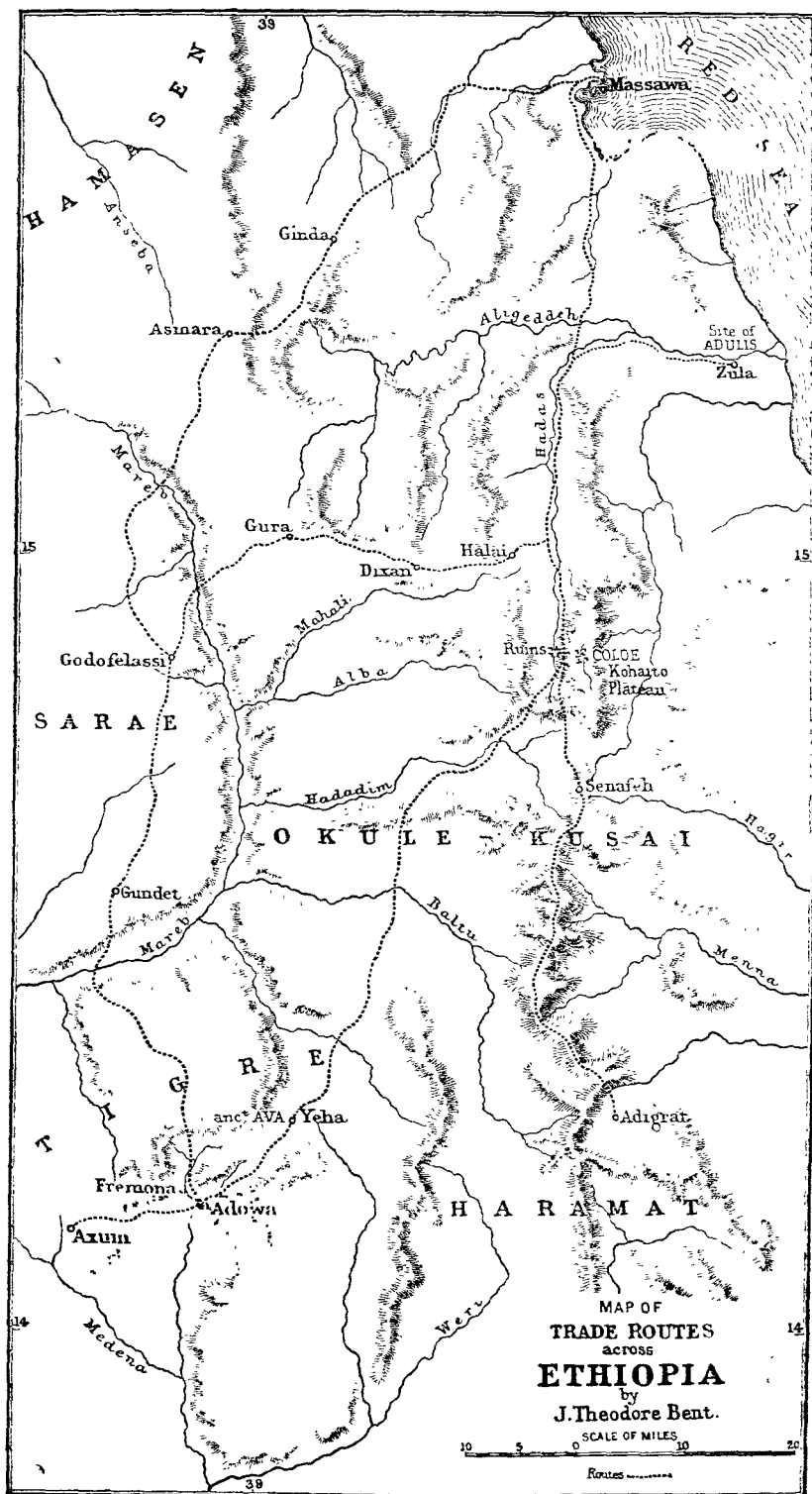
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the middle of the plateau. They cover a very large area, and there are columns of several temples still standing which give us exactly the same form of architecture as those to be seen at Adulis, and obviously connect the two places together. Probably Koloe was a summer residence for the inhabitants of Adulis, possessing as it does a magnificent climate and absolute immunity from attack. The chief feature however of Koloe is a large lake or reservoir in the centre of the town which was supplied by the above-mentioned stream, and which was shut off along one side by a very fine dyke or wall of obvious Hellenic structure, with two sluice-gates which have fallen into ruins. This wall to keep back the water in the lake is 219 feet long. The centre part between the sluice-gates is the strongest, and is built with stones 5 feet long and 1 foot $6\frac{1}{2}$ inches high, entirely without cement, but with slabs between each course and throughs inserted so as to form a zigzag pattern, and each course recedes a few inches the better to withstand the force of the water. Altogether this dyke at Koloe is one of the most interesting remains I have ever seen of ancient engineering skill, and except for the sluice-gates is still in an excellent state of preservation.

It is a curious fact that Ptolemy mentions after Koloe another place called Koloe palus, or the lake of Koloe. Ptolemy himself evidently believed it to be further inland, and geographers who have discussed the question have imagined it to be the Lake Tzana or Dembea beyond Gondar. It certainly would be a curious fact if the Greek name of Koloe occurred so far inland, and no other geographer gives it. Stephanus Byzantius calls Lake Tzana $\Psi\acute{\epsilon}\beta\omega$, and I think the most likely solution is this—that Ptolemy heard of Koloe, of which he knew the position, and also of the lake at Koloe, the distinctive feature of the place, but, not knowing that the places were identical, he placed the lake further inland. At any rate, the identity of names and the existence of this very remarkable lake on the high plateau at Koloe make this a very likely supposition.

At the foot of the plateau in the valley below, where we descended on the western side, there are the remains of a large ancient village, with the columns of a temple in the midst of the same class of architecture as those at Adulis and Koloe. Doubtless this village was on the great trade route inland, and served as a place of halt for the caravans at the foot of the hill on which the town of Koloe stood.

Three and a half days' journey inland towards Axum the traveller reaches a village now called Yeha, which is built on the ruins of an extensive town, and has in its midst a magnificent piece of ancient architecture preserved to us from the fact that it has remained a church and monastic establishment down to the present day. Alvarez, the Portuguese ambassador, describes it in 1520 as the convent of Abba facem. "Near the church is a very grand and beautiful tower, remarkable not only for its well-proportioned height as for its thickness

and excellent masonry, but it has already begun to fall into ruins, though built of very strong stone, covered and enriched with such excellent work that it looks as if it were nothing less than a royal palace such as I have never seen another like." Alvarez also tells us the current Abyssinian legends that it was the place to which Menelek, King Solomon's son, brought the ark, and that it was subsequently the residence of Queen Candace.

We stayed there (February 1892) two days to take photographs and study the surroundings, and found many traces of interesting architectural buildings which space will not here permit me to describe. We found also seven Himyaritic inscriptions of the best period of Sabaean work, which are at present being deciphered by Professor D. H. Müller of Vienna. The existence of this strong Himyaritic temple and town in the centre of Abyssinia is a very strong proof of the Sabaean origin of the Ethiopian empire. In fact, we may take it that the backbone of the early Ethiopian power came from Arabia, and the race still, though degenerate and mixed with negroid blood, have amongst them the type of their origin. I hope subsequently to describe more fully the temple and ruins of Yeha; at present I will confine myself to a few geographical points in connection with it. I thought it curious that such an important town as this must have been should be unnamed by any ancient geographer, but on searching into the question more minutely I think I have arrived at a very likely solution of the difficulty.

A scrap written by Nonnosus, ambassador from the Emperor Justinian to the King of the Axumites (522 A.D.), gives us the information that at "a spot called Ave"—Ave is between the cities of Axum and Adulis—"we saw a great quantity of elephants, about five thousand" (Nonnosus 'Photii Bibliotheca'). Then we must turn to the Adulitan inscription. Many authors who have discussed this stone believe the second part to be later than the first, which recounts the victories of Ptolemy Euergetes. However, without the original it is impossible to speak definitely. Certainly the victorious monarch came from without, and began his victories at Adulis, and gradually went inland. First he conquered some towns near Adulis, then "*he crossed the Nile,*" which words commentators have supposed to be interpolated as they presently occur again; then he conquered Ava and various other places in that vicinity. Now Yeha is only 12 miles from the Mareb, a branch of the Nile, and would naturally be the first place he would come to after crossing that river. Modern geographers unaware of the existence of ruins at Yeha have imagined it to be Adowa, a place about five hours from Yeha, where there are absolutely no traces of ruins earlier than the Portuguese; but joining the evidence together, it seems clear that the Ave of Nonnosus, the Ava of the inscription, and the Yeha of to-day, are identical.

Furthermore, the Adulitan inscription does not mention Axum at

all, but accurately describes the second crossing of the Nile (the Tacazze), the conquest of the kings of Simoen, and the deep snows on these mountains, which we also saw from Axum with our own eyes, and several other points which undeniably prove accurate geographical acquaintance with the district. Hence it seems fair to argue that Axum, which was known to all subsequent geographers as the capital of the district, did not exist when the inscription at Adulis was cut, but that it sprang up later under the influence of the Ptolemies, as the monoliths and architectural features of the place testify.

The ruins at Yeha are undoubtedly older than those at Axum, erected by the earlier Sabæan occupants of the country. There are Himyaritic inscriptions at Axum of which I brought impressions of three, but they are later than those from Yeha. Consequently it would seem that Ava was destroyed and Axum took its place as capital of Ethiopia Troglodytica during the reigns of the Ptolemies; this will account for the omission of the name of Ava in the earlier geographers, such as Pliny, Ptolemy, and the 'Periplus'—the name possibly survives in the Aualitic Gulf. Ptolemy says (4, g.): "The whole coast which is near the Arabian and Aualitic Gulf is called Regio Troglodytica as far as Mount Elephas, in which live the Adulites and the Avalites." Also we read that the Avalites were great importers of myrrh into Sabæa, from whence it was imported into Europe. Hence we may suppose that prior to the Greco-Roman occupation of Adulis the whole of this district was occupied by traders from South Arabia who exported "gold-dust, ivory, leather, hides, and aromatics," for the Sabæan markets, and that their capital was at Ava, the modern Yeha, for it is quite clear that no more extensive remains of this Himyaritic occupation occur elsewhere. Since writing the above, Prof. D. H. Müller has sent me positive proof of this theory, as he reads one of the inscriptions we found at Yeha thus: "*his house Awa*." This Prof. Müller connects with the worship of Baal-awa, common in Southern Arabia, and thereby he supplies us with the key, not only to the ruins of Yeha, but to the more recent ones of Axum.

A curious fact came before our notice when at Yeha. Here alone, within the frontiers of the Abyssinian empire, did we find prosperity and agricultural pursuits in active progress, owing to the disturbed state of the country. The narrow valley here is one rich garden, the fields being watered with conduits and bearing rich crops; and the reason for this was given that there are numerous caves in the mountain exactly above Yeha into which the inhabitants drive their cattle and deposit their grain when threatened by bands of marauders. If, then, Ava was the capital of the Regio Troglodytica it is not at all unlikely that Troglodytes, or cave-dwellers, got their name from this very fact. Agatharcides tells us that the Troglodytæ were cave-dwellers, "shepherds with separate chiefs and princes of tribes. Their habitations

were not merely clefts in the rocks, but carefully-wrought vaults laid out in cloisters and squares, like the catacombs at Naples, whither in the rainy season they retired with their flocks and herds." From this it would appear that the ancients looked upon these people as not altogether devoid of art and civilisation.

Professor Sayce has lately discovered from Egyptian hieroglyphics that the name was originally Trogodytes into which the Greeks inserted an "l," trying to establish the derivation of *Τρώλην*, or a cave, to suit the habits and customs of the people; but the name really is native and not of Hellenic origin.

Passing by Adowa, which is an entirely modern town—in fact its origin is probably due to Portuguese influence—and the erection of the Portuguese fortress and convent at Fremona, about half-an-hour from the town, the traveller reaches Axum and its splendid relics of a bygone civilisation.

Space will not permit me here to discuss the ruins at length, suffice it to say, that the monoliths here and the architectural features show that the same people who built Yeha eventually developed their art here under Greco-Roman influence into the highly-decorated objects of Axum. At Yeha we have the plain rude monolith, with an altar at the base; architectural fragments at Yeha also prove that there too they had the storeyed monoliths with windows and fortifications represented in stone. At Axum we start with the original rude monolith—just blocks of unhewn stone stuck in the ground; then we have a monolith with cornered edges and notches up the side; then a further development with bands around the rude stone and representations of beams supporting the storeys. Next, we have the highly-decorated monolith with a sham door cut in the stone, lock and handle all complete, and nine storeys with windows divided by beams and eventually topped by a rounded cap, on the back of which a sun is represented, and on the front a metal plaque had been stuck. Finally we have a monolith on the top of which a Greek tomb is cut, supported by a column with a lotus for its capital, pointing strongly to a late Greco-Egyptian influence.

There is no doubt these monoliths were the product of sun-worship, and that the altars at the base were used for sacrifice; we have one with channels cut in it to let the blood flow down, and Greek kylices cut in the stone, presumably for the reception of the liquid, almost identical with the altars for Mithraic worship found at Ostia in Italy.

All this points strongly to the Arabian origin of the ruins, even if we had not ample testimony to confirm this theory in Himyaritic inscriptions of several periods. At Axum we have the rude stone monument of Arabia, the Bethel, or bætyle, of the Phœnicians in all its several stages, from the uncut stone to the highly-decorated monolith, leading up by numerous storeys to the emblematical home of the great Sun-god.

That Greek influence was at work at Axum down to the Christian epoch we have ample proof from the inscriptions; several of them speak of offerings to Ares in return for victories; others allude to Zeus and Herakles, and some of these are as late as the third century of our era, proving beyond doubt that the Ethiopians were pagans of the Greco-Roman persuasion down to their conversion to Christianity, and that the story of their having belonged to a Judaic form of worship ever since the days of Solomon is one of the many religious myths which have encircled Ethiopia.

I fancy the theory has been principally based on the fact that they have numerous Judaic customs in their ritual to be found in the books of Moses; but then the Jews were a Semitic race, and so were the early Ethiopians, with doubtless many customs and religious observances in common.

A FORGOTTEN VOYAGE OF JOHN DAVIS.

By WILLIAM FOSTER.

STUDENTS of Admiral Markham's standard work on 'The Voyages and Works of John Davis the Navigator' * may remember that, speaking of the period which elapsed between the end of 1589, when Davis returned to Falmouth after serving in the Earl of Cumberland's third voyage, and August, 1591, when he embarked as captain of the *Desire* in Candish's second "attempt for the South Sea," the editor remarks that "whether he remained on shore . . . or whether he kept at sea, is uncertain;" though, for reasons given, he inclines to the latter alternative. The following passages—found quite casually whilst searching for something else—show that the Admiral's inference was correct; that John Davis *was* at sea during part at least of this period, and that, moreover, the voyage in which he was engaged was one of some importance, being, it would seem, the earliest recorded attempt on the part of English merchants to reach India by way of the Cape. †

The extracts in question are taken from a manuscript volume in the British Museum, officially described as Lansdowne MSS., No. 241, a closely written folio of some eight hundred pages, which John Sanderson, Turkey merchant, used as account book, letter book, and general storehouse of information, and in which in two distinct places he jotted down

* Hakluyt Society's Publications, vol. lix. (1880).

† The expedition under Raymond and Lancaster, which is usually reckoned as the first English attempt in this direction, did not start until April 1591. Sanderson does not actually say that the voyage was to be by way of the Cape of Good Hope, and they did not get far enough on their voyage to enable us to lay down their intended route with absolute confidence; but all the evidence points to that conclusion, and there can be little doubt that such was their intention.

notes of the principal events of his life, and more particularly of his travels in the Levant.* From this we learn that Sanderson (who does not appear to have been related, at all events closely, to the William Sanderson who so munificently supported other schemes of John Davis) had not long returned from three years' sojourn in Turkey, Egypt and Syria, when he came into contact with the navigator. Both were men of enterprise; both were keenly interested in those East Indies which were then close preserves of the Portugo-Spanish crown; and the result of their conferences was a bold plan for a voyage which should carry the flag of St. George into the forbidden seas, and win for England a share of that wealth which was the main strength of her hated rival. Sanderson, in the course of his trading in the Levant, must have heard much of the wonderful lands whence came so many of the products that passed through his hands; and he was doubtless well acquainted with the efforts of Newbery and his companions to reach India *viâ* Aleppo and the Persian Gulf.† He was familiar with the difficulties and dangers that attended the overland traffic through Syria and Egypt—perils by the Turks, perils by the Spaniards, perils by the Moorish pirates that infested the Mediterranean—and he saw that, could the ships of Philip on the alternative route be evaded or defied, a direct trade with the Indies might be opened up, and the products of those countries placed at once upon the markets of England and Holland at rates which would bring a fortune to the lucky promoters of the voyage. The account he gives is of the briefest; but it would seem that he and Davis soon found others willing to put a venture into the enterprise; and by the autumn of 1590 all was ready for the start.

How they fared in their bold attempt may best be told in Sanderson's own words. His book contains two accounts of the voyage, both very brief; and, as they are our sole sources of information concerning the expedition, it may be well to give them in full, simply modernising the spelling and punctuation:—

“In September, 1590, we set sail in the *Samaritan* of Dartmouth, bound for the East India, victualled for thirteen months at the least, and well-manned; John Davis captain and pilot, Edward Rieve‡ master. About the Medores [Madeiras] we were overtaken with a great storm, in which extremity we lost our pinnace consort; but afterwards met with an English ship who had saved our men. We had before that storm

* Reproduced, in great part, by his friend Purchas in his ‘Pilgrimes’ (Book IX.).

† At a later date, Sanderson set his apprentice to copy out from among the papers of the English ambassador at Constantinople the five letters on the subject of this expedition which were printed by Purchas (Book IX, chap. xviii.).

‡ “A little rich Reve, Dier, and others of Dartmouth were owners, victuallers, and voluntaries, were Randall Cotton, Jo. Arundell, Thomas Moore, Edward Rivers, I myself and others, who all came home by cross and loss, for which our God Almighty's mercies His holy name be ever magnified.” (Marginal note in Purchas, *vide infra*.)

been in divers fights with Spaniards and braved by a couple of French at unawares. In that voyage, of one hundred and five men and boys we lost only one. A very hot fight we had with an armado of Spain. She gave us seventeen great shot over-night, and in the morning fought some four or five hours; she shot down our topmast, and through our ship and sails above forty times. Yet no hurt to any of us in person except a poor fellow which was touched on the leg with a great stone shot, which shot rested in the ship; the next day an ill surgeon cut off the leg above the knee, in which torment of cutting, sawing, and searing, the poor wretch died in his arms. This jolly Spaniard left us, for if he had durst, he might have laid us aboard. With this fight, and the extreme storm we had before passed, our *Samaritan* was so crazy and leaky, that [we] all in general took our turns at the pump; [we] made four or five hundred strokes in a glass [for many days and nights together]*; with the said water we watered our fish.† So we were forced to return for England, where at Falmouth we arrived in February [1591]; so to Dartmouth. In that voyage we went ashore [only*] at Safia, Santa Crus, and the Medores, as I remember."

The other account is somewhat shorter:—

"Now intended I a voyage unto the East India, [and] victualled out the *Samaritan* of Dartmouth at Dartmouth; Ed. Rive, master, Jo. Davis, captain, J. Sanderson, E. Rivers, R. Cotton,‡ J. Arendall, each victuallers, T. Percie, T. More, R. Mortimore, W. Hart, each voluntary gentlemen who served for their shares—in all one hundred and five men and boys, victualled for thirteen months. But what with an extraordinary and extreme storm and stout fight, we had a forced return, [having] escaped sundry and marvellous dangers. [We] pumped many days together above four hundred strokes in a glass. [We] lost in fight only one poor man, who with a great round stone shot out of a cannon was hit on the leg, the shot resting in the ship; by John Jane§ a bad surgeon's handling, he died the next day, and had his body thrown overboard after his leg. After five months, we arrived ship and pepper || safe in Dartmouth,

* Added in Purchas.

† This suggests that, finding it impossible to effect the object of their voyage, they had set to work to procure a cargo, or part cargo, of fish, for which there was always a market in England.

‡ Afterwards commanded the *Dainty* in Candish's second voyage to the South Sea. He was a great friend of John Davis.

§ This would seem to be Davis's faithful companion and the chronicler of his voyages, though he is always described elsewhere as a merchant or supercargo. Possibly he had undertaken the duty in the absence of a regular surgeon; or again, as the name has evidently been inserted at a later date, Sanderson's memory may have been at fault.

|| This reference to pepper is difficult to explain; but the word itself is plain enough in the manuscript. It is, of course, possible that they had procured some at one of the three ports at which they touched.

lost and defrauded of all by Captain Davis, *who since was murdered by those of Japan*.* [I] borrowed to bear my charge there and bring me home. Ed. Rivers and myself in the snow went in our boats from Dartmouth to Exeter, as I remember. There hired I a horse for twenty shillings, and came with the carrier to London."†

Thus ends the story of this voyage, trifling perhaps in itself, and barren of results as far as its immediate object was concerned, but interesting on account of one at least of the adventurers, and also from the fact already mentioned of its being the first attempt of our countrymen to follow the Portuguese route round the Cape. It is unnecessary to say anything in refutation of the wild charge against Davis made in the last paragraph, as that is sufficiently disproved by his general character for uprightness and integrity; but it may be mentioned that Sanderson was evidently a man of violent temper, and his book abounds with malicious statements concerning the various persons with whom he was brought into contact.

It is proverbially easy to be wise after the event; and, having once found this manuscript account of the voyage, we are in a position to point out that the first of our two extracts already existed in print in the pages of Purchas (Book IX, chap. 16, para. 2), and to wonder that the passage should have escaped the notice of Davis's biographers. But it must be borne in mind that, in the first place, it occurs in a part of the reverend geographer's work where one would least expect to find it, namely, in the general account of John Sanderson's travels which is given in the section devoted to the Holy Land; and secondly, that although a John Davis is mentioned by name, his identity with *the* John Davis could only be conjectural in the absence of the link now supplied by the sentence italicised in the second extract. These few words, however, clench the matter, and seem to leave no reasonable doubt that future biographers of this distinguished seaman will be able to add to the roll of his voyages the attempt "for the East India" in the *Samaritan* of Dartmouth.

* This crucial passage—which at once identifies Sanderson's Davis with the great navigator—is interlineated, having apparently been inserted in a revision made at a later date (probably about 1615).

† One cannot refrain from adding to this account a side-note made by Sanderson in later years, when, with the thought of death pressing heavily upon his mind, he went through his autobiographical notes, underlining any acts of sin already mentioned, and adding any others that he could recall, this amongst the rest:—"Before my going out on that voyage, walking under a rock near the compass at Dartmouth, I found an iron shot, which I took up. [I] kept it, and carried it aboard the ship *Samaritan*. I gave fire to a demiculverin. God of His mercy forgive me that voyage's whole proceeding!"

RECORDS OF THE EAST INDIA COMPANY.*

By STEPHEN WHEELER.

THE first letter-book of the East India Company, never before in type, contains a mass of material bearing directly on a most notable chapter in the annals of commercial geography. The period covered extends from the year 1600, the date of Queen Elizabeth's charter "to certeine Aduenturors for the discoury of the trade for the East Indies"—here printed from the oldest extant manuscript—to 1619, by which time the Company had established factories at Bantam in Sumatra, at Firando in Japan, in Borneo, Siam, and Celebes, at Surat in the Moghul's dominions, and on the coast of Malabar. Among the more curious papers in the volume may be noticed "a discription of the iland of Banda," written early in the seventeenth century. The list of merchandizes "spent and uttered" there includes "Brass peeeces of ordinance with chambers in the breeches . . . brought from Chyna as thought"; and doubtless identical with the breech-loading cannon seen by Ferdinand Mendez Pinto on the borderland of China and Tibet. In a "discription of the iland of Amboyna translated out of the Dutch in 1605" will be found a list of English and Hollands goods there on sale, such as "long peeeces with snap hances the cocke to stand on the hither side the panne;" that is to say, "snaphances," or guns, with spring locks. The inhabitants of the Celebes are described as heathen, but very good to deal withal, and to live by, "and which doe hold good right and justice and order after their manner."

In a letter addressed to their factors at Bantam, April, 1609, the Company say they have been given to understand that a trade for diamonds may be had to Siquedana in Borneo, "whereof we would be glad to tast." The early history of English enterprise and discovery in the Eastern seas, from Java to Japan, is abundantly illustrated. No less interesting are the frequent allusions to projects for opening up an overland route between Europe and India. Writing in 1607 to their loving friends William Keeling and William Hawkins, the Company exhort them, on their arrival at Aden, to send letters "by some Moores that go to Argier (Algiers) to Richard Allen, Consull theare, or to Aleppo to Mr. Paule Pyndar, Consull." A couple of years later the Company's factors were instructed to endeavour, by all possible means, to send intelligence overland, either by way of the Red Sea to Cairo, whence letters would be forwarded to Marseilles, by the Persian Gulf or by caravan through Persia. There is a letter from one Richard Steel, who in 1616 proposed to reopen the trade between Scind and Ormuz, the native merchants being weary of their long travel overland from Lahore

* 'The First Letter Book of the East India Company.' Edited by Sir George Birdwood, M.D., K.C.I.E., assisted by William Foster, B.A. London, Bernard Quaritch, 1893.

to Isfahan, "which is five months' journey, besides the toyles and customes with loss of many camels." According to Mr. Steel the yearly trade between Lahore and Persia at that time amounted to 12,000 or 14,000 camel loads.

More than one allusion will be found to various projects for discovering the North-west passage. For instance, there is the agreement made in 1602 with George Waymouth, who for the inestimable benefit of his native country and his own perpetual honour, was sent out to discover the passage by the north-west towards the parts or kingdoms of Cataya or China or the back side of America; the said George Waymouth to receive £500 on his arrival at any port within the kingdoms of Cataya, China or Japan. There is also the pass granted in 1606 to John Knight for the discovery of the North-west passage. Knight himself landed on the coast of Labrador, and was never heard of again. The journal of his expedition has been printed by Mr. Clements Markham in one of the volumes of the Hakluyt Society's series. The reader may recollect that Pietro della Valle sailed with an English ship's captain who averred that he had discovered Greenland and showed a narwhal's tooth in proof thereof.

Apart from the literary value of these old records, and the interest that may attach to letters addressed by James I. to that most puissant prince Akbar, or to the great King of Japan, the volume is especially useful for the indication it affords of the spirit which animated the founders of the East India Company, and impelled the adventurers of those days to seek in untravelled regions new outlets for English trade, and new ports where their ships might be laden with the wealth of the East. Nothing could exceed the far-sighted solicitude with which minute instructions were drawn up for the guidance of the captains and factors. It was a great enterprise seriously undertaken, and though these seventeenth-century speculators trusted much to Providence—always to be propitiated by the daily reading of prayers on board their ships and at their factories—as little as might be was left to chance. Dangers were foreseen, and, if possible, averted. Nor was it thought that any English wares, of whatever quality, would find a market and sale in Asia. "We requier you," the Company wrote, "to be more carefull and more diligent to write us, than heretofore you have beene, as alsoe in seeking out what sorts and kinds of all clothes, kersies, and wollen comodities are theare most vendible." The Manchester cottons decorated with figures of ballet girls, which, according to Mr. E. F. Knight are on sale in Chitral, would not have been considered suitable for the Eastern market in the early days of the East India Company.

Of the care which has been bestowed on the printing and editing of these records it would be difficult to speak too highly. Sir George Birdwood's introduction is by itself an exhaustive essay on the history of commercial intercourse between Europe and Asia; while the notes and a carefully-compiled index are useful as well as elaborate.

THE SURVEYS OF INDIA, 1891-92.

DURING the year ended September 30th last, the operations of this Department were under the superintendence of Colonel H. R. Thuillier, R.E., the Surveyor-General, and his annual report, which has quite recently reached this country, bears testimony, as usual, to a large out-turn of valuable administrative and scientific work. One of the most important events of the year was the appointment of Lieutenant-Colonel Sandeman as Director of Bengal Surveys to superintend the record and preparation of record of rights in Bihar. Of this survey, which has called forth much criticism and enquiry both in India and England, a concise history will be found at page 117 of the 'Memoir on the Indian Surveys, 1875-1890,' published the year before last by the India Office. It is not a new undertaking, as has been erroneously represented in some quarters, but the revival of operations that were instituted under Colonel H. Barron in 1885-86, and which had had their origin in the recommendations made by the Indian Famine Commission in 1880. Other cadastral operations took place during 1892 in Burma, Assam, and the North-West Provinces. With respect to principal triangulations, one party continued to work in Burma along the meridian of $96^{\circ} 30'$, and extended measurements for a direct distance of 195 miles, while a secondary series emanating on the parallel of 21° north latitude was laid out for a distance of 96 miles eastward. Three parties and two detachments were engaged in topographical surveys in the Bombay Presidency, Baluchistan, the Himalayas, and Mergui district, Lower Burma. The area covered by their work amounted to 9909 square miles. Four parties were employed on forest surveys, and one party and one detachment on traverse surveys, while six arcs of longitude were measured by electric telegraph between Waltair, Madras, Bolarum, Jabalpur, Calcutta, Bombay, Fyzabad, and Dehra, thus completing the scheme of differential longitude determination which had been laid down for India proper. There remains some more work of this description to be done in Burma, Baluchistan, and Persia at some future date, but it has been postponed at present in favour of more pressing requirements. Observations with self-registering tide-gauges have been made at fourteen stations in India, Burma, Ceylon, the Andaman Islands, and Minicoy, and tables of prediction based on these are published as usual by the Indian Government.

The area geographically surveyed during the year is considerably less than that obtained during the two previous seasons, no opportunity having occurred for work in Persia. On the other hand, a good deal of new country was mapped out in Burma and Southern Baluchistan. In the former of these two provinces the two parties, Nos. 11 and 21, have brought the quarter-inch scale survey within measurable distance of completion, except in the extreme north, where the country, though very interesting from a geographical point of view, is too unsettled for regular operations. Nevertheless, even here opportunities do occur now and then for acquiring information, and surveyors are attached to the military and police expeditions despatched in various directions. Mr. Kennedy accompanied the column under Major Dalzell to Maingkwan in the Hukong valley, and returned to Mogaung, his starting-place, by the Chindwin route, passing through the Taro valley. The important villages in the Hukong valley are 'Ntup'nsa ($26^{\circ} 41'$ N. latitude), the centre of the rubber trade, Ningbyen, where there is, strange to say, a colony of Goorkhas, Saraw, Palawbum, and Lalaung, on the hills above which the larger amber mines are said to be. The chief products of this region are india-rubber, jade, amber, ivory, and opium. During this expedition Mr. Kennedy reconnoitred 3750 square miles.

During January Captain H. M. Jackson visited a portion of the Bret country, which lies south-west of Karenni, in the valley of the Tuchaung, and collected some interesting information regarding the inhabitants. They are much like the Karennis in appearance, customs, religion, and dwellings, but their language is a good deal different, being probably an old dialect that has remained unchanged owing to the isolation of the people in a somewhat inaccessible valley, through which there are only two trade routes, and those difficult and little used.

The despatch of a military column under Sir William Lockhart, K.C.B., against the Isazai tribes in the Indus valley in October, 1892, enabled some surveying work to be accomplished by Captain Wahab, one result of which was to show that the Hasanzai territory south-west of Baio extends further than was supposed.

The operations in Baluchistan, though termed topographical and not geographical, were of considerable importance. They consisted *inter alia* of a detailed reconnaissance for a line of railway communication between Karachi and Kharan, which was carried out by Captain Mackenzie. The Makrán triangulation series was extended westward by Mr. T. E. M. Claudius, and now forms a perfectly connected series based on the great Indus series of the G. T. S. extending through the districts of Bela and Makrán and on to the borders of Persia, following closely the parallel of 26° N. latitude. Mr. Claudius was also in charge of a squad of surveyors, who brought in a total area of 19,084 square miles on the quarter-inch scale of new ground in Kolwan and Makrán, a barren and hilly region, where progress was much hampered by the unsettled state of the tribes. Some useful triangulation was also carried out by Mr. E. A. Wainwright and Rai Bahadur Hira Singh, and topography round Gwatar by Khan Bahadur Yusaf Sharif.

A general inspection of the work of some of these detachments in the field was made by Colonel Holdich, who has also published a most valuable and interesting 'History and Ethnography of Makrán' in the appendix to Colonel Thuillier's report. It is impossible here to give an adequate idea of the amount of research in Colonel Holdich's paper, which is elaborated with all his wonted care, but a few of his more striking conclusions may be noticed. Premising that Makrán possesses an unwritten history earlier than that of Herodotus, who describes Southern Baluchistan and Makrán as included in parts of the fourteenth and seventeenth Persian satrapies, Colonel Holdich says we must go back to 2000 B.C. to find the origin of the remarkable *dumbs* or rough stone-built tombs which exist in many parts of the country, and examples of which have been described by Colonel Mockler. From Mr. Bent's researches in the Persian Gulf and his identification of the Bahrain Islands with the early home of the Phœnicians, Colonel Holdich inclines to think the *dumbs* of Makrán belong to the same race. Again, Arrian's list of tribes inhabiting the country intermediate between the Indus and Persia can in nearly every case be traced and identified at the present day, showing how little the ethnography of Makrán as it existed in Alexander's time has been affected by subsequent waves of invasion, Arab and Tartar, that have left so deep an impression elsewhere in the history of the East. The products of the country then so highly esteemed—the myrrh and spikenard—are still to be found, and the euphorbia of the sandy wastes and the mangrove of the swamps are still much as Arrian describes them, while with the exception of a few islands such as Pola, Kerabia, and Derenbosa, the broad features of the coast are the same. In any case, the changes are insignificant compared with the enormous geological changes which must have almost reconstituted the climate of high Asia within the same period. Colonel Holdich is also disposed to believe that it is to the Phœnicians that we owe the name Baluchistan, the land of Balus, Baal, or Bal, the sun-god, the Baluchis being curiously enough comparatively recent arrivals in the country.

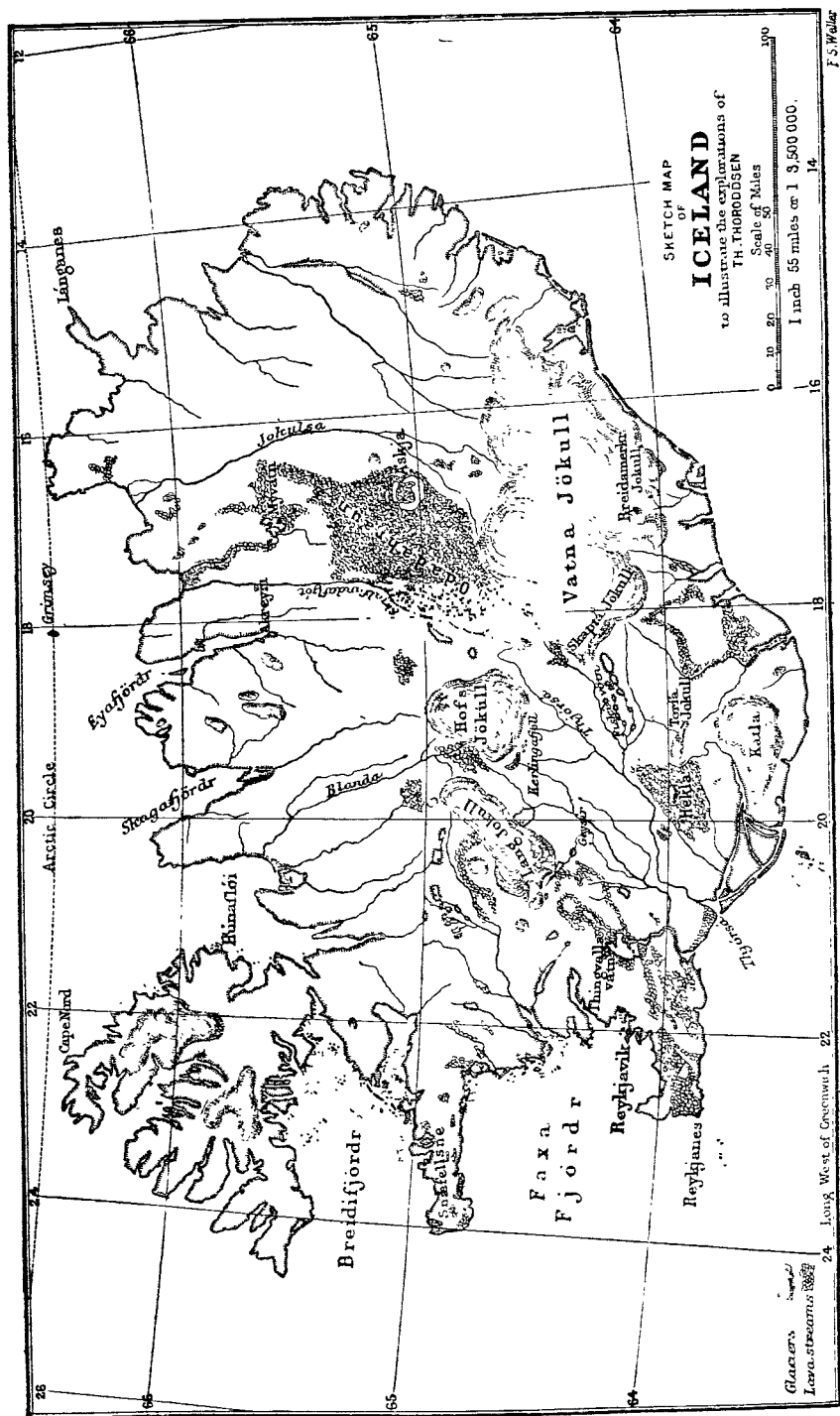
A dark period of history extending over more than a thousand years intervenes between the disappearance of the Greeks and the Arab invasion of Makrán, as told by Ferishta. It seems probable that it was during the misty era of the Arab occupation that European intercourse between India and the East sprung up, and for four or five centuries, while Arabia dominated the East, Venice was mistress of the Mediterranean, and as yet Alexandria was the great emporium of the West. Venetians and Arabs were intimately associated in perhaps the greatest trade confederation of the world. Venetian ducats, so Colonel Holdich says, used to pass current not long ago among the coast people. In the course of excavations at Quetta Sir James Browne discovered some there, and another was found at Tiz by Mr. G. White of the Indo-European Telegraph Department. Colonel Holdich says that the history of Venetian trade supremacy must have existed through those centuries during which Asia and most of Europe were convulsed with the gigantic conquests of Turks and Mongols, and would be of absorbing interest if efficiently recorded. "The chief interest of Makrán history centres however in the busy period of Arab supremacy which extended from early pre-Mahomedan centuries until the Khalifs gave way to the Turks, ere these again were supplanted by the Portuguese. It was when the heavy-prowed, square-sterned Arab dhows and buggalos were busy bringing gold and ivory from the African coast, or carrying spices, spikenard and myrrh from Makrán, or gold brocades, purple and fine linen from India to the great central marts of Egypt, that in all probability Zimbabwe, the gigantic old-world city of Mashonaland, was a flourishing Arab possession. It was then too most likely that the 'ghorbastas,' the great stone 'bunds' of Makrán were built, for these show the same skill in uncemented masonry as the walls of Zimbabwe, and about the contemporary cities of Tiz and Pasni are found the same extraordinary wealth of relics in celadon, china, and Persian pottery as are described by Mr. Bent among the African ruins."

In addition to Colonel Holdich's paper on Makrán, there is a description by Mr. Claudius of the southern portion of the same country, over which his triangulation was extended, and an account by Captain Wahab of the tribes round Aden. His detail survey covered 4420 square miles on the half-inch scale and nearly 7000 square miles of triangulation, the former including practically all the tracts under British influence. The southern part consists of an open plain, extending some 80 miles along the coast on either side of Aden, and varying in width from 6 to 30 miles. The remaining two-thirds of the region surveyed is a mountainous tract rising steadily to the Yaman highlands. The tribes in the neighbourhood of Aden, such as the Abdali and some sections of the Fadthli and Subaihi tribes, are amenable to British influence, but those inhabiting the remoter hills have little or no respect for our power. A survey of the peninsula of Aden on the eight-inch scale will be set on foot as soon as financial considerations permit, and advantage will probably be then taken to complete the small unsurveyed parts of the surrounding country.

DR. THORODDSEN'S EXPLORATIONS IN ICELAND.*

TRAVELLING in the interior of Iceland is very arduous work, for the country lies high and consists for the most part of sand and lava deserts, often absolutely

* Report of a Paper read at the Meeting of the Geographical Society of Berlin on April 15th, 1893.



F. S. Weller

without grass. The traveller has consequently to take with him even fodder for the horses. The summer, moreover, is short, and the route into the interior occupies much time. For ten summers Dr. Thoroddsen has made excursions through the interior, and during that time has covered about 6000 miles on horseback. There are no roads in Iceland. In the inhabited districts the traveller follows paths formed by the horses' hoofs, and in the uninhabited regions he has to ride where he can and direct his course by the aid of the mountains and the compass, although the latter, in consequence of the ferruginous character of the soil, often undergoes considerable variations. It is very seldom that a journey can be undertaken before July, because in the spring the snow-water soaks the ground and snow still lies on the high plains; indeed in the higher regions pasture-ground for the horses can rarely be found before the end of August. The climate of the interior is harsh and changeable, and snow-storms are experienced in the middle of summer. The sand-storms are often a very great source of annoyance, large tracts being covered with volcanic ashes and shifting sand. For a journey in the interior the traveller has to be well equipped and to have plenty of patience, because he is often obliged to remain many days in his tent on account of bad weather. Good saddles and harness are absolutely necessary, as well as a stock of horse-shoes, as the latter wear out very quickly on the lava-fields. The Iceland horse is a capable, hardy, and intelligent animal, to which one becomes much attached after having ridden it for some time. Among the greatest dangers connected with travelling in the interior are the numerous rapid glacier-streams; their muddy waters render it impossible for the bed of the stream to be seen, and man and beast are very liable to get stuck in the mud; the fording-places change from day to day. Every year men perish in the glacier-rivers of Iceland. Iceland is a plateau region, composed of older and more recent volcanic masses; no formations older than those of the tertiary period have been discovered. The average altitude of the country is from 1650 to 2000 feet; the few lowlands are not extensive, and comprise only one-fourteenth of the entire island. The population is everywhere confined to these lowlands, to the coast strip, and to several small valleys; the whole of the highland is uninhabitable, and only its extreme edges are used as summer pasture-grounds for sheep. Iceland is composed of basalt and palagonite breccia. The latter is found in the centre and more towards the south, but the greater part of the west, east, and north coasts consists of basalt. Rising from the high interior plateau like broad domes are the great glacier mountains. On the south coast at the end of the glaciers which stream down from these mountains there are neither harbours nor fjords, because both the latter have been filled up with the matter brought down by the glaciers. The basaltic regions, on the other hand, are split up by numerous fjords, and there are among them many good harbours. Iceland abounds in lakes. On the highland are large groups of moraine lakes, some of which have been formed by the damming-up of glacier-streams, some lie in the sunken parts of lava-streams, while others are typical crater lakes. In 1889 the traveller visited to the west of the Vatnajökull the magnificent group of crater lakes standing quite alone. The basaltic formation is divided into two strata by peat formation of the miocene period. In the clay strata have been found the remains of a considerable vegetation of the American stamp, which shows that at that time Iceland must have had a temperature like that of Northern Italy to-day. Scattered all over Iceland are patches of liparite, which by their bright colour are easily distinguishable from the dark basalt. The glaciers of Iceland have a total area of 5000 square miles. The raw, cold, humid atmosphere is an important factor in increasing the glacier formation. The Vatnajökull alone measures 3090 square miles. The

height of the snow-line on the southern side is 2000 feet, on the northern side 4300 feet, the air in the interior being much drier. The appearance of the great Iceland glaciers resembles that of all Polar regions; the highest summits of the mountains are covered with flat or slightly vaulted ice-fields, from which proceed comparatively few but very large glaciers. The glacier explosions (*jökulhlaup*) are peculiar to the country; they occur when there is an eruption of an ice-covered volcano. On such occasions extensive tracts of country are inundated and converted into a roaring sea full of floating masses of ice. Within historical time fjords and small bays have in this way been filled up. During the glacial epoch Iceland was completely covered with an ice-covering of about 3300 feet. In Iceland there are many traces of a shifting of the shore in post-glacial time, especially in the north-west of the island. Here the shore-lines are grouped in two levels, the higher being from 230 to 260 feet and the lower from 100 to 130 feet above the sea.

Very large expanses of country (4500 square miles) in the middle of the island are covered with recent lava deposits; these districts, frequently without vegetation of any kind, present a miserable appearance. The largest connected lava-desert is the *Odáðahraun*, in the north of the *Vatnajökull*, which covers an area of over 1500 square miles and lies from 2000 to 4000 feet above the sea-level. Its cubical contents are calculated to be at least 283,000 cubic yards. This great lava-field has been formed by the eruptions of about twenty volcanoes. The form of the Iceland volcanoes is not the typical *Vesuvius* form, but it consists of a number of dome-shaped lava mountains, with a small inclination of 1° to 8° , as in the Sandwich Islands. The most frequent form of manifestation of volcanic eruption is the formation along a space in the ground of a series of low craters which is often some miles in length. Since the colonisation of Iceland in the ninth century more than twenty volcanoes have been active; *Hekla* has had the largest number of eruptions, viz., twenty-one, and *Katla* twelve. The greatest eruption in historical time was that of *Skaptá* in 1783, in consequence of which half of the horned cattle in the island died, eighty per cent. of the sheep, seventy-seven per cent. of the horses, and nine thousand three hundred human beings, or about one-fifth of the entire population, perished in the following two years from famine and sickness. The volcanoes are not, as was formerly supposed, limited to the region of the palagonite breccia. On the Bay of *Faxafjörður* are many small volcanoes which have broken through the basalt. Hot springs by the hundreds are scattered throughout the whole island. Springs containing carbonic acid are found mainly in the *Snæfellsne* peninsula, and solfataras in the middle districts, where there are still active volcanoes. In the neighbourhood of the solfataras one always finds a number of boiling clay basins. The most magnificent solfataras were discovered by Dr. Thoroddsen in 1888 in the *Kerlingarfjöll* near *Höbsjökull*.

The colonisation of Iceland from Norway commenced in the year 874, and by the year 930 about the same area was inhabited as is now the case. The aristocratic republic lasted until 1262, in which year the personal union with Norway took place. Together with Norway, Iceland fell into the hands of Denmark in 1389. In ancient times the Icelanders carried on an independent commerce. In the fifteenth century the trade became English, in the sixteenth Dutch, and in 1602 the Danish system of monopolies was introduced, which ruined the country from an economical point of view. In 1854 trade was made free, and in 1874 the Icelanders obtained a free constitution of their own. In more recent years the country has evidently made great advances. Although the common people live under oppressive economical conditions, in no country in Europe are so many books printed and sold as in Iceland, having regard to the number of its inhabitants. With a population

of seventy thousand, there are in Iceland five printing-houses, the first of which was established as far back as 1530. These printing-houses publish ten newspapers and eight periodicals. Of the seventy thousand inhabitants, sixty thousand live by cattle-breeding, especially sheep-breeding. The number of sheep is estimated at one million, and of horned cattle at twenty thousand. The cultivation of barley, which in former times was never found to be profitable, has now been abandoned altogether. On the other hand, horticulture has made rapid strides; potatoes cabbages, and rhubarb flourish very well. Iceland has had no proper forests during the post-glacial epoch, but the birch thickets were once more widely extended than they are to-day, the sheep-rearing industry having destroyed the old bush-woods. *Betula intermedia* seldom attains to more than a man's height. Only in one spot in the eastern district did Dr. Thoroddsen find specimens 30 feet high, as well as some mountain ashes (*Sorbus aucuparia*).

DR. SIEMIRADZKI'S EXPLORATIONS IN PATAGONIA.

DR. JOSEF SIEMIRADZKI's paper on Patagonia (*Petermann's Mittheilungen*, 1893, iii.) contains a great deal of valuable information about a country the exploration of which has been greatly neglected. The official documents lately published are, in Dr. Siemiradzki's opinion, utterly unreliable, having been either compiled from untrustworthy sources, or falsified for speculative purposes. The geological part of the 'Informe Oficial,' published by Professor Doering (in 1882), contains reliable information about the geology of the Argentine Republic; but it only gives scanty information about the Indian territory. Ducloud's map of the Pampa Central (1887) is evidently insufficient for regions which have not yet been visited by Europeans. As to Rhode's maps of Neuquen and of the Pampa Central (1886 and 1889), they are, Dr. Siemiradzki shows, absolutely fantastic in some parts.

The author went, in November 1891, from Bahía Blanca to General Acha, thence south and west to Choele-Choele, and thence westwards, exploring the whole basin of the Limay River up to Lake Nahuel Huapi. By the end of April 1892, he crossed the Pass Lonquimay and entered Victoria, returning to Buenos Ayres *via* Mendoza. A short trip to Uruguay completed the journey.

Two different regions, as already remarked by Darwin, must be understood under the name of Pampa; the lower region, from 130 to 260 feet (40 to 80 metres) above the sea, which does not extend southwards further than the Tandil Hills, and the higher Pampa, 650 to 980 feet (200 to 300 metres) high, which gradually rises in the west of the Salado River to the altitude of 3280 feet. A gently sloping terrace, which stretches in a north-western direction from Mar del Plata towards Villa Mercedes, separates the two regions. The lower Pampa is covered with loess, which the author supposes to be an alluvial deposit of the Paraná River transformed by prevailing winds into steppe loess. It is thus similar to the loess of the South Russian Steppes (which, by-the-way, is not of a properly fluvial origin), but differs from it by the want of the well-known humus covering. The loess covers pliocene shell-bearing sands of marine origin, which attain an altitude of 130 feet in the La Plata region, and of 250 feet at Bahía Blanca. Further north the loess attains a great thickness, and the underlying formation is not seen in the river-banks.

The little unfinished railway, which leads from Bahía Blanca to Hucal, crosses the spurs of the Tandil Hills (Sierra Baya and Sierra Chica), which rise by about 500 to 600 feet over the Pampa. Hucal (430 feet) lies in one of the numerous little valleys which intersect the steppe, and have a much richer vegetation than the

steppe itself. These valleys are marked on maps as Indian routes, and originate in the numerous parallel granitic and porphyritic ridges which intersect the Pampa in a general direction of north-west to south-east. The lowest point observed in this region had the altitude of 800 feet. The climate is extreme, a night frost on December 10th being followed by a temperature of 120° Fahr. The vegetation and fauna are characteristic of steppe-lands. The hills of Lihue-Calef form a series of spurs of the Cordillera, and form a marked dividing-line with regard to climate, geological structure, fauna and flora, between the high grass-steppe in the north and east, and the Patagonian plateau which stretches, with monotonous uniformity, westwards towards the Andes, and southwards to the woody region of Rio Gallegos.

The Patagonian plateau is covered with old crystalline ridges running north-west to south-east, and generally described under the name of "Mahuidas." The whole is covered with small boulders, which are more angular in the neighbourhood of the ridges, and make a sheet about 35 feet thick, cemented by calcareous matter in its lower parts. The structure of the plateau is made plain by sections in the deep ravines of the Colorado and Rio Negro. A fine-grained, shaly sandstone, belonging to the lower oligocene, is there seen to fill the spaces between the low crystalline ridges.

Beyond the Lihue-Calef ridge, the thorny bushes characteristic of Patagonia soon appear, and also representatives of its fauna.

Another ridge, the southern spurs of which are known as Choique-mahuida (Ostriches ridges), runs in the same south-eastern direction; it is wild and uninhabited, only its granite dome, about 1650 feet high, is well known to the surrounding population. The hills consist of red porphyritic granite, and run in parallel ridges along the right bank of the Cura-có, between the southern extremity of Lake Urre-Lafquen and River Colorado. The highest ridge is the south-western, and may attain an altitude of from 1300 to 1600 feet above the sea. Its vegetation is very poor; no river flows from it, the only water being a salt lake, about 27 miles distant from the Colorado.

The wide, sandy valley of the Rio Saiado, containing the bitter lake Urre-Lafquen (at least 700 feet of altitude), lies between the two ridges. A number of smaller lakes surround the chief lake, and all wells in the desert (Salitral) also containing brackish water which, however, is used for drinking. Further to the south-east the valley of the Rio Saiado (Indian Cura-có) is deeply cut in into granite rocks, but contains no water except from rain. As to the valley of the Colorado, which is nearly 7 miles wide, it is sunk for nearly 250 feet into the miocene sandstone. The river, when full, is from 330 to 440 yards wide, and is rapid, although Indians and the horses can swim across it; in the winter it contains but little water. The valley has but a poor vegetation, but is well inhabited on account of its being the highroad to Chili for traders in cattle.

The country between the Rio Colorado and the Rio Negro has the same character as above, and is also intersected by low ridges running north-west to south-east. The valley of the Rio Negro is wider and deeper than the preceding, the altitude at Choele-Choele being not more than 330 feet, while the steep cliffs on the left bank rise about 450 feet—a broad, waterless, and flat tract of land extending, on the left bank, between the river and the footings of the hills. Water is everywhere in great demand, and the irrigation canals constructed at the mouth of the Neuquen are insufficient even for the Roca colony. Colonel Belisle, who has planted an orchard is compelled to have water pumped day and night from a laguna into the irrigation canals. A steamer keeps up communication on the Rio Negro between Roca and Carmen de Patagones from July to February, the months of sufficient water.

The Limay River at its junction with the Neuquen is from 220 to 330 yards wide, and the amount of water contributed by the two rivers for the formation of the Rio Negro is nearly equal. Its current is swift, but powerful steamers navigate it as far as Lake Nahuel Huapi. Most of its tributaries are also navigable. It remains navigable all the year through.

The mountains Sierra Roca marked on Argentine maps do not exist, the space between the Neuquen and the Limay being simply occupied by the high plain, which already attains an altitude of 1400 feet. Its steep walls facing the rivers were taken for mountains. Patches of excellent meadow-land are found in the Limay Valley on its left bank, while on its right the river flows close to the walls of the high plain. The red sandstone cliffs of the Patagonian plateau rise higher and higher as one advances south-westwards up the Limay, and attain altitudes of from 2650 to 3000 feet at the Cordillera of Catalin. The sandstone becomes also dislocated in this locality by andesite lavas, large sheets of a porous lava also covering the sandstone and thus raising the level of the plain to 3300 feet above the sea.

At Noueira Dr. Siemiradzki left the Limay to cross in a western direction the Cordillera de los Angosturas, which consists chiefly of granite intersected by lavas and covered with oligocene sandstones. The ridge runs in a meridional direction, attaining 5000 feet above the sea. Traces of glaciation are evident, the whole being covered with glacial drift. Plenty of water and rich meadows make the Cordillera pleasant to look at, even in the absence of trees. It is inhabited by Pehuenches Indians, driven from Tandil. Volcanic tuff and sheets of lava cover the 2650 feet high plateau which leads to the valley of Collon Cura (2000 feet).

The ground between the Collon Cura and the second Cordillera rises westwards in terraces formed by glacial deposits (ground moraines). As to the river itself, it is 250 to 330 yards wide, rapid but navigable, and receives several tributaries from the right.

The passes across the Andes at the head of the Chemen-huin are low (2300 and 2430 feet), and a low hill only separates the Quilquihue, tributary of the Chemen-huin, from the Huechu-echuen, a streamlet flowing into Lake Picau-llu (Lacar), whose waters are emptied into the Pacific Ocean. The highest spot of the Andes in this latitude is the Chapel-có (8000 feet), but altogether the second Cordillera (de los Cypresses) is but a narrow andesite wall, rising 6600 feet above the sea.

The Lake Nahuel-Huapi is much smaller than it is shown to be on Rhode's map. It consists of three branches, and granite mountains, snow-covered and more than 6500 feet high, rise on its southern shore. The climate at this lake is very wet, and the rich vegetation bears testimony to the abundance of water. Altogether, the flora and fauna entirely change their characters at the foot of the Cordillera.

The best passes to Chili are in the north of the lake, while to the south of it there is no passage, even for foot-passengers. The best way to Chili is the Lonquinmay Pass (35° 30' N.), but even this pass is only good for riding on horseback, or for the two-wheeled "catangas" of the Chili cattle-traders. In winter all passes are rendered impracticable by snow.

The greatest inaccuracies of Rhode's map appear in the region in the upper course of the Collon-Cura River; but we cannot follow Dr. Siemiradzki in the enumeration of these errors, which will be best seen on comparing both maps. The Collon-Cura is made by the confluence of the Rio Alumine and Rio Catalin, which are separated from each other by the gneiss-granite mountains of the Cordillera di Catalin (about 6600 feet high), a high grass-steppe, nearly 3300 feet high, stretching in the west of the meridionally-running ridge. The Alumine River flows

in a very narrow valley dug out in the plateau; but in the west of it the country is not flat, a whole series of extinct volcanoes, at least 5000 feet high, rising over the plateau, and making a chain of volcanoes independent from the Chilian main ridge.

The last inhabited spot on the Argentine territory is the estancia of an American farmer on the Puluneri streamlet. Snow attains here in winter a depth of 3 feet, while in the Alumine Valley, only 300 feet lower, cattle can graze all the winter through.

The laguna Alumine (3000 feet) is very picturesquely situated amidst a plateau which but slightly supersedes this altitude, and has in the south of it an extinct volcano, whose lapilli are spread for miles round in thick layers; the river of the same name takes, however, its origin—not in the lake, but a little further north, in a continuation of the upper valley of the Bio-Bio, where the waters flowing to the Pacific and those flowing towards the Atlantic take a common origin. From this spot a steep slope leads to the fertile and wide valley of the Upper Bio-Bio, which does not take its origin in the laguna Hualletue. The vegetation is, however, rather poor, and it is only in the west of the frontier post Longuimay that one enters in the Chilian Cordillera, the uninterrupted Araucanian virgin forests, which stretch as far as Victoria, but are rapidly cleared by German and Chilian colonists. At Collipulli the last traces of these forests disappear, and one enters the regions of cornfields and vineyards.

The coast-region Cordillera is insufficiently known. It consists of grey granite and seems to be a remainder only of the largely-extended palaeozoic formations of the South American continent.

The final conclusions of the Author are very interesting. He sees in South America two chief systems of mountains. The old palaeozoic system runs north-west to south-east, and it forms, besides the oldest part of the Coast Cordillera, the spurs of the Andes in the Argentine Pampa, in Bolivia, Paraguay, and Brazil. A younger system of upheavals, which prevailed since the Trias epoch till now, has a meridional direction. Three different eruption periods may be distinguished in this system: (i.) the eruptions of metaphyres and stratified porphyries (jurassic and cretaceous); (ii.) the basalts of the cretaceous period; and (iii.) the andesites of the Tertiary and Quaternary period; this latter is only limited to the Andes—two great crevices running along them—one on the west slope of the great Cordillera, and the other in the east of it.

The similarity of these great features of the region explored by Dr. Siemiradzki, as compared with the structure of the great plateau of East Asia in Siberia, is most striking, if we only remark that the north-west to south-east direction of the palaeozoic upheavals in America is represented by south-west to north-east upheaval in Asia. As to the Tertiary and Quaternary andesite eruptions on both sides of the border ridge of the plateau, the similarity is singularly striking. (P. K.)

GEOGRAPHY AT THE FORTY-SECOND GERMAN EDUCATIONAL CONGRESS.

THIS congress was held on the 24th, 25th, and 26th of May in Vienna; and thanks to the exertions of Prof. Dr. Penck, geography was represented for the first time. Altogether there were eleven papers given in the Historico-geographical section, of which seven were of geographical import. The president of the section, which

embraced ninety-eight members, was Prof. Dr. Oberhummer (Munich). The Vice-President was Prof. Dr. Oppel (Bremen).

The president opened the discussion by an address on "The present state of our knowledge of the ancient world." He gave a clear and exhaustive review of the German and other literatures in which investigations upon the subject were recorded, and he summed up by dwelling upon the necessity of rejecting the historico-philological aspect of ancient geography, and of adopting, in its stead, the historico-geographical method.

A paper followed, "On the history of the so-called dwarf people of Africa," by the well-known traveller, Dr. Lenz (Prague).

The next paper was read by Dr. A. Oppel (Bremen), on "The scholastic progress of geography." He showed a large wall map constructed by himself, in which the progress of geographical discovery from mediæval times up to date was pictured in graduated form, according to centuries. The history of the discoveries of the Earth's surface is, according to Dr. A. Oppel, a most useful, instructive, and stimulating addition to geographical or historical teaching, and absorbs but little time. Until the present date, however, there has been wanting an efficient means of representation which would show this progress both clearly and impressively. The lecturer then proceeded to explain his map, which was meant to supply this generally felt want. Land discoveries of the last five centuries were distinguished by a special body colour, while the maritime discoveries were indicated by lines. During the debate which followed, the map was acknowledged as being a most graphic one, and the utility of this branch of knowledge was unanimously recognised.

Prof. Dr. Fr. Umlauf spoke next "On the progress of map drawing in schools," and on the methods of drawing maps. He arrived at the following conclusions: Map-making should not receive too great an attention in schools, because the time available is usually insufficient for repeated drawings; it is preferable to study well-printed maps. For the same reason the tracing of maps is not to be rejected. Outline maps are but poor substitutes, but still, if well used, they furnish the memory with good bearing-points. Care should be taken to avoid the use of "normal lines," or any artificial helps for construction, as they only overburden the memory. The best plan is to draw maps merely with the help of the projection; and even then, for small areas, to use only the central meridian and the central parallel. In no case should oral instruction and verbal indications be abbreviated in favour of map-drawing itself, for only by the way the former are handled and understood can we recognise both the efficient teacher and the apt pupil.

The last lecture of the first day of session was given by Dr. Grissinger (Vienna), On the vertical distribution of the population of Austria-Hungary. The towns and villages of the monarchy are situated at heights above the sea level, ranging from 6232 feet down, and it is interesting to note that the most elevated towns are in no case found near the highest summits, doubtlessly in consequence of the greater steepness of the ground. Referring merely to the larger places, 3000 of which contain 36 per cent. of the total population, we see that they are only found up to an average height of 3608 feet above the sea-level. The distribution of places, as compared with the population, was shown on a graphic table, on which different heights were represented by contours of 100 meters (328 feet) apart. The relatively largest towns are found, in the Austrian territory, between the heights of 656 feet and 944 feet, and in the Hungarian country between 328 feet and 656 feet. Only the Alpine lands deviate from the general rule that the maximum population is found at the height where the greatest number of inhabited places occur; a fact amply illustrated by the large population of Vienna itself.

Dr. K. Peucker lectured next on: The Construction of a School Atlas; the following is a short summary of the paper:

The projection ought as far as possible represent the natural globular curves of the area covered by the map in order to constantly remind the pupil of this most fundamental of all geographical facts. The lines of the projection should serve to represent this bodily form just as the contours and hachures serve to represent the bodily form of mountains. In drawing positions, the latest reliable maps ought always to be consulted, and in generalising forms the following rule ought to be observed: characteristic individual forms are only to be represented in reduction as long as they can be easily distinguished—the lines ought never to appear as if drawn with a trembling hand. Dr. Peucker proposed to establish a third independent factor for representation in addition to land and sea—namely: glaciers and ice (white). The pupil can then understand at a glance why the poles are not yet discovered, and why the so-called north-west passage does not really exist. The representation of the ground is also materially helped by this additional graphic form. If it is wished to represent not only a relative, but an absolute height it is desirable to use graduated shadings of body-colour for the various elevations, only thus can the exact analogy between the sea-level and geographical latitude find its adequate cartographical expression. Finally the lettering should not be considered as a *necessary evil* of the map, but rather as an intrinsic part of the same. A map is essentially a rudiment and requires description; without the latter it is as worthless as would be a plan of a town upon which the streets had not been named. More pains ought to be taken than have been taken hitherto, to improve the beauty of the characters and also greater care should be given to the proper distribution of the names.

The last paper during the conference was given by Professor Dr. Penck, and entitled: "The state of Geographical Instruction in the Secondary Schools of Austria, Germany and France."

How little care had been given to geography in the gymnasia of Austria and Germany was evident from the fact that in *none* of the forty-one educational congresses held up to the present, had there been a geographical section. Indeed, up to the present day, the study of geography is only officially recognised in the lower gymnasia of Austria, while in Prussia geographical instruction has even retrograded. France forms a great contrast to the other two countries, for since 1870, geography is a branch which is taught with enthusiasm, and receives ever-increasing care. It is quite astonishing to see what a real store of geographical knowledge is imparted to the children. This is as it should be, for geography belongs to general culture, and surely general culture is the aim of our secondary schools! The lecturer proposed a resolution referring to Austrian and Imperial German secondary schools, which was finally seconded after a lively debate, and adopted in these terms: "The Geographical Section of the forty-second German Educational Congress is of opinion that Geographical Instruction, considered as an independent branch, is of absolute necessity in *all classes* of the gymnasia and similar institutions."

THE MONTHLY RECORD.

EUROPE.

Survey of the English Lakes.—During the latter part of June and the early part of July, Dr. H. R. Mill has been engaged in making a systematic bathymetrical survey of the larger lakes of Cumberland and Lancashire. He was assisted in this work by Mr. E. Heawood, and by Mrs. H. R. Mill, and for part of the time by Mr. A. J. Herbertson, the cost being defrayed by a grant from the Council. The soundings made were designed not for the purpose of a navigational survey, but in order to delineate the general configuration of the various lake basins. Soundings were accordingly made at close intervals along a series of lines crossing the lake at right angles to its axis, and never more than half a mile apart. The ends of each section were fixed by reference to landmarks shown on the 6-inch Ordnance Survey maps whenever this was possible. In the case of a change in the coastline since the survey was made, or in a featureless stretch of coast, the exact positions were determined by sextant angles. The transverse sections were connected by oblique sections, along which the soundings were more widely spaced, and in addition longitudinal sections were made whenever it was practicable to do so. The work of each day was plotted in the evening, and contour-lines of depth drawn from the figures obtained. Any peculiarity in the run of the contour-lines was confirmed by additional observations on the following day, and in many cases very close soundings were required. On Derwentwater over eight hundred soundings were required to define the contour-lines of each 25 feet of depth, but in the other lakes a smaller number was usually found sufficient. In Derwentwater the greatest depth found was 72 feet, but the surface of the lake was much below its usual level, being lower, probably, than has ever previously been recorded. Bassenthwaite Lake, though simpler in configuration, was found to have about the same maximum depth. Ullswater, the largest lake in England except Windermere, was found to have a maximum depth of 208 feet, but it is quite possible that deeper soundings might be obtained. This lake was remarkably interesting on account of its division into a series of deep basins separated from each other by wide bars, from the most pronounced of which a rocky islet rises showing the characteristic marks of ice-erosion very clearly. Coniston Lake is simpler, being one practically straight deep trough, the deepest part of which is at least 184 feet below the surface. Wastwater, the last of the lakes to be sounded, was similar in configuration though of much greater depth, an area 1 mile long and $\frac{1}{4}$ mile wide, being deeper than 250 feet. The flatness of the floor of this depression may be judged by the fact that 258 feet was the greatest depth found in it. Samples of the deposit from different parts of each lake were secured

and will be examined by a specialist. Temperature observations were also made and a number of interesting facts connected with the penetration of solar heat in the deep water discovered. It is probable that a similar survey of Windermere will be undertaken in the beginning of September, and possibly some of the remaining smaller lakes may also be sounded. Although this work makes it possible to delineate on maps many square miles of England hitherto quite unexplored, its main interest will lie in the comparison of the configuration of the English lakes with those of Scotland and other countries. The complete discussion of the soundings will necessarily occupy a considerable time.

Mr. C. T. Dent's Winter Photographs of the Alps.—There is at present on exhibition in the map room, a series of photographs of Alpine scenery taken by Mr. Clinton T. Dent in mid-winter. They are not only remarkably fine specimens of photography, but possess considerable value from a geographical point of view from the manner in which they show the action of the weather on the rocks, and the snow and ice forms; the view of the seracs on the Rosenlauri glacier is a striking example of the latter. The perfection of some of these photographs is well shown by the manner in which they have stood the test of considerable enlargement. Among the most striking photographs in this interesting collection, are the following; the Eiger and Mönch from Mürren; Gletscherhorn, Breithorn and Ebnefluh, from Mürren; Rosenlauri Glacier; the Wetterhorn from below Grindelwald; Monte Rosa, Gornergrat and Hothäligrat from the Schwarz See; a very fine enlargement of a photograph of the Matterhorn from the Riffel Alp; a spur of the Täschhorn, and avalanche tracks, Furggen glacier. Though special mention has been made of these views, the whole series is in all respects one of the finest exhibitions of amateur photography that has ever been on view in the Society's map room.

North German Tertiary and Diluvial Deposits.—The possibility of the tertiary deposits of North Germany having been derived from an old formation of laterite in Scandinavia is discussed (*Ausland* 1893, Nos. 11 and 12) by H. J. Hass, of Kiel. Having shown that in the ancient Scandinavian continent rocks of the required nature (granite, sandstones, etc.) were present, while the warm and moist climate (especially the absence of frosts), indicated by what we know of the flora of tertiary times, was also favourable to the formation of laterite, he points out that the North German deposits are exactly of a character to have been formed by the large streams which in those days would wash down this material to the sea. The red colour characteristic of laterite, due to the oxidation of iron, is not generally seen in North Germany; still, in certain shore formations of Denmark, in which the heavier constituents would be most likely to be found, important ironstone formations do occur. The diluvium, too, it is held, was more probably loose material transported from Scandinavia than the result of the erosive power of the ice; and the quantity of iron in the well-water of many of its towns may be derived from laterite brought along with materials of different character.

Phosphorescence in the Odessa Limans.—The *limans* in the neighbourhood of Odessa, that is, the salt-water lakes on the shore, which have already lost their connection with the sea, are sometimes seen to emit a phosphorescent light, and the fact was especially striking in 1890–1891. As the *Noctiluca miliaris*, which renders the water of the Black Sea phosphorescent, does not inhabit the *limans*, their water was carefully investigated by M. Zabolotuyi (*Memoirs of the*

Novorossian Society of Naturalists, vol. xvii. No. 2, 1892), who found that all the light is due to an infusorium, *Glenodinium* (allied to *G. cinctum*), from the *Peridinidae*. It appears that it is the protoplasm of the little animal which emits the light.

Hungarian Place-Names derived from Fishing Industry.—The Hungarian Geographical Society's *Bulletin* contains a short paper by Otto Herman, in which the author points out the difficulty of accounting for the large number of Hungarian place-names derived from terms connected with the fishing industries on the theory usually advanced by historians—that Hungary was at one time covered with innumerable *piscina* or fish-ponds. A more probable explanation is suggested by the division of the fishing-grounds of the Balaton Lake, particularly near the Tihany Peninsula, where the fisher-people, cut off from the main streams of civilisation, retain many ancient customs and regulations unaltered. The inshore waters surrounding the peninsula are divided into thirty-six hexagonal fields some 400 yards to 800 yards long and 250 yards wide, each having a distinctive name; and every fisherman knows exactly the position and limits of each area, the nature of the bottom, and state of the fishing in each at any particular time. In this way it appears that thirty-six place-names can be accounted for at once, for each fishing-ground gives its name to the part of the shore opposite to it. It would be interesting for the author to compare the development of names in the historic case of Tihany with the modern example of Long Island Sound; the areas allotted for oyster-fishing by the New Haven Commissioners receiving names from the fishermen renting them, which will probably be represented sooner or later by place-names in New England. One purpose served by the Tihany names, that of enabling watchers on the heights to describe the positions of shoals of shield-fish to those in the boats, corresponds curiously to the similar method of marking pilchard shoals, common in Cornwall.

ASIA.

Visit to Ulu Kinta and Ascent of Gunong Kerban, Perak.—A recent number of the *Perak Government Gazette* contains some notes by Mr. G. A. Lefroy, the chief surveyor of the State of Perak, on his visit during 1892 to Ulu Kinta and ascent of Gunong Kerban. Gunong Kerban, which is 7127 feet in height, is probably the highest point in Perak territory. Soon after leaving Ipoh the expedition struck eastward, and followed up the bed of the Sungei Choh to the Sungei Suntu; thence in a north-north-east direction until the Kinta River was reached. The main river was followed up to the Kuala Chermin, from which the ascent of Kerban is made. The bed of the Kinta River is here about 1029 feet above sea-level. The ascent was made by Batu Shallek, a spot about 3395 feet above sea-level, and Gunong River, about 5600 feet in height. The valley of the Kinta has a great tendency to erode away on its right bank, hence the slopes on the Kerban, or north side, are extremely precipitous; while those on the south are long and gentle in comparison. Much of the Kinta district appears suitable for planting purposes. Kerban, to a height of about 5000 feet, is composed of grey granite rocks and boulders with a shallow soil. Above 5000 feet the granite is overlaid by a schistose formation, which is being rapidly removed by denudation; and the evidences of numerous landslips in the neighbourhood would point to the fact that the crest of Kerban has been much higher in past ages than it is now, and the crest is the remains of a secondary formation which has now disappeared except on the tops of the higher mountains and some isolated hills in the low country in Larut. This formation is

traversed by several quartz veins. The change in the geological formation at 5000 feet is plainly marked by the characteristics of the flora, which at this elevation becomes very stunted.

Siam.—M. Fournereau's report of his archæological researches in the kingdom of Siam is published in a recent number of the *Bulletin* of the Geographical Society of Paris. He arrived at Bangkok in April 1891, and after studying there some Siamese peculiarities of architecture, left in the dry season for the North. After a journey of eighteen hours on the River Menam he reached Kamfeng Fet, near Sajanalaya, which was once the holy town of the Brahmins of the North, but it has now almost wholly disappeared. M. Fournereau then went by land to Sukhodaya through forests of teak and by many old quarries of ironstone. This was the capital of the Thais, and the temples must have been of great importance. M. Fournereau found there slabs of sandstone with engraved figures and inscriptions. It is three days' journey from Sukhodaya to Sangkalok, the latter having been once a great commercial centre famed for its pottery, and M. Fournereau counted about forty old kilns. There they made porcelain like that made in Korea, but the attack of the northern barbarians put a sudden stop to this industry. From Sangkalok he travelled two days by elephant to Thung Jang, whence he went to Uttharadit, the last Siamese capital of the North, and took a glance at Muang Labli, the first large Laotian village. Among other cities he visited was Lophaburi, founded in A.D. 600, and there the kings resided during the floods.

Exploration in Northern Syria.—In the last number of the *Quarterly Statement* of the Palestine Exploration Fund, the Rev. Dr. G. E. Post publishes the diary of a journey in which he accompanied Professor West, who was charged with extending the accurate map of Palestine to the Lebanon and Anti-Lebanon ranges. With the exception of the south-eastern flanks of Hermon, which are volcanic, the Lebanon and Anti-Lebanon are both of limestone formation. The effects of erosion by water are much more distinct on the Lebanon chain on account of the greater rainfall; and the sublime gorges which furrow its western slope bear no comparison with the tame wadies of the Anti-Lebanon. Lebanon is a single ridge with a series of commanding peaks rising from it, while the Anti-Lebanon is of complicated structure. It is formed by the great ridge of Hermon in the south, from which five ridges diverge northward like the rays of a fan. The space included between these ridges is a plateau ranging from 4000 to 5500 feet above the sea, the ridges rising to an elevation of 7000 to 8400. The conical summit of Halaim, which has a more distinctive flora than the rest of the system, rises at the northern end of the second of the five ridges, counting from the west. Dr. Post made an extensive botanical collection in the course of his journey.

The Position of Mount Sinai.—In the *Asiatic Quarterly Review* for July, Professor A. H. Sayce gives his reason for believing the term Sinaitic Peninsula to be a misnomer. He traces the origin of the belief that Mount Sinai was situated in the peninsula to the Christian anchorites of the second century, and the belief, although more than once questioned, has grown stronger down to the present day. Professor Sayce shows from the Old Testament records and the Egyptian monuments that certainly Mount Sinai was not in the peninsula now called Sinaitic. The "Yam Suf" of the book of Exodus, translated Red Sea in the Bible, he identifies as the Gulf of Akaba, and he is inclined to look for Mount Sinai "on the borders of Midian and Edom, among the ranges of Mount Seir, and in the neighbourhood of the ancient sanctuary of Kadesh-barnea, whose site at 'Ain Qadis has been rediscovered in our own day."

Local Museums in the Russian dominions in Asia.—A new geographical, anthropological, and archæological museum is to be opened at Vladikavkaz. There are already some very interesting ethnographical collections which have been given to the museum. The local museum at Minusinsk in East Siberia is steadily developing; it appears from its catalogue that it represents very well the natural history and geology of South Yeniseisk, as well as its stone and bronze age relics, and some of the petty trades of the present population. The museum has also a good library. The society for the study of the Amur regions, which has its seat at Vladivostok on the Pacific, is also doing good work. The society has a small museum, and has made the beginnings of a library. The proceedings of the society are published in the local paper *Vostok*.

The West Siberian Branch of the Russian Geographical Society has 107 members, of whom 71 are in Omsk, and the remainder in other parts of the region. The Branch published last year one volume of Memoirs (*Trudy*), and took part in the organisation of the meteorological net. Five meteorological stations were established last year at Altaiskaya, Kolyvan, Biisk, Atbasar and Zoneiuregorsk.

AFRICA.

Orthography of Egyptian Place-names.—Dr. Bonola Bey, in a communication to the Khedivial Geographical Society, published in the *Bulletin* for May, discusses the question of the orthography of geographical names, with special reference to Egypt. After a statement of the schemes put forward for facilitating a consistent rendering of foreign names in other countries, he shows the peculiar difficulties which exist in Egypt, both as to the correct Arabic names and their transliteration into the Roman alphabet. Any scheme for use in Egypt must, he points out, consider both forms, as the official Egyptian papers are published in European languages. The author believes that a Government Commission should be charged with the preparation not only of a scheme, but of an index of names. To this committee, should it be appointed, Dr. Bonola wisely leaves the choice of the European language according to the phonetic system of which the Arabic names should be transliterated. He formulates his own conclusions thus:—(a) To prepare a geographical dictionary of Egypt in Arabic, edited carefully with special regard to the derivation and meaning of the names. (b) To prepare a universal geographical dictionary in Arabic, in which the names should be transcribed phonetically according to the language of each country. (c) To prepare a geographical dictionary of Egypt, with the names transcribed from the authentic Arabic form in Roman letters, according to a system to be arrived at by the Commission.

The Ruins of Kilwa.—H. F. von Behr gives, in a recent number of the *Deutsches Kolonialblatt*, a description of the ruins on the island of Kilwa Kisiwani, East Africa, south of the modern town. The greater number of the ruins belong to the last of the three main epochs in the history of the place, the modern Arab, which dates from the expulsion of the Portuguese, between 1680 and 1690. The Arab town occupied the north side of the island; but nothing in the remains points to its having surpassed in style of architecture the modern towns on the same coast. The ruins of two mosques a little further south seem rather older, but do not by any means deserve the praise bestowed upon them by Von der Decken. An imposing fort on the north-west coast is said to have been built by Said Said at the beginning of the present century, but seems only to have been used for holding slaves. In spite of their greater age, the remains of the Portuguese fortress on the west side

are in better preservation. This must have been an important stronghold, and shows signs of having been built by skilled architects. Chance led to the discovery by the writer of a hitherto unnoticed ruin occupying a particularly strong position on the west coast. This appears of much greater age than any of the others, and may possibly date from the old Arab and Persian epoch.

The District of Lourenço Marques.—From the Annual Report on the consular district of Lourenço Marques, we learn that the trade of this district during the year 1892 has been most unsatisfactory. There is not, and never has been, any genuine trade at the port, owing to the fact that the surrounding country is perfectly undeveloped, and that throughout the district there are no enterprises to be supported. The harbour of Delagoa Bay, on the north side of which the town of Lourenço Marques is situated, is well known as the finest in South Africa. The outer bay extends along the coast north and south for a length of some 70 miles between $25^{\circ} 20'$ and $26^{\circ} 20'$, and its width, from the coast to the entrance of the inner harbour, is about 28 miles. From the northern extremity to Inyak Island, north of Inyak peninsula, a line of shoals extends, between which good channels exist. The inner harbour extends from Reuben Point to abreast of Matolla River, with a length of 7 miles, and average width of 1 mile. The Rivers Tembe, Umbelus, and Matolla discharge into the inner harbour, the two former being navigable for a considerable distance from their mouths. Owing to the heavy drought during the last two years, the mealie crop has been an entire failure. The syndicate formed in Lisbon to develop the pearl fisheries commenced operations last year. The district conceded for the pearl fishing extends from the mouth of the Sabi River, 70 miles south of Sofala, to about the twenty-second parallel of south latitude near Cape San Sebastian, an extent of about 120 miles. Operations for the present are being carried on at the group of islands known as Bazaruto. These islands lie a few miles off the coast below Sofala and the Sabi River, in long. 38° E., and lat. 22° S. Large coal deposits are said to exist in this district. Great progress is being made in the construction of the line of railway from Lourenço Marques to Pretoria. The Portuguese section, 56 miles in length, has now been completed for about three years. At the end of last year the railway was finished to Alkwaar, about 140 miles from the port. The total length of the line from Lourenço Marques to Pretoria will be 346 miles, and is expected to be completed before the end of 1894.

AMERICA.

Salton Lake.—Mr. Jacques W. Redway sends the following:—Late advices concerning Salton Lake, in the south-eastern part of California, show that this old basin is again refilling. In May, 1891, through the courtesy of the editor of the *Proceedings* of the Royal Geographical Society, I published a description of this lake and the manner of its sudden formation. At the time it was my belief that the Colorado River would keep one of its channels into the Colorado desert permanently open. The current, however, was unable to cut the channel down to the low-water level of the river, and Salton Lake finally almost disappeared. So great is evaporation in this region that not even the whole volume of the river would suffice to fill entirely the area below sea-level to leave the area below the low-water datum plane of the river out of consideration altogether. With a shade temperature ranging from 100° to 122° and the humidity 15 per cent. to 20 per cent. of saturation, evaporation will be the most potent factor in preventing the formation of a permanent lake there. Mr. E. W. Lang informs me that the water in two large streams is debouching from the

Colorado into the desert, but whether the area involved will be as great as that covered two years ago, is a matter of conjecture only. The present inflow I believe to be due mainly, if not wholly, to the unusually heavy snowfall in the mountain slopes, drained by the head streams of the Colorado. It will be remembered that the river in this locality practically flows around the side of a hill, and when, at high-water stage, it overflows, the overflow of necessity takes place on the down-hill side, and the surplus of water escapes to the desert to the westward. When the overflow of two years ago occurred, one of the channels, New River, through which the surplus escaped, was a channel that had probably served the same purpose many times before. New River now contains running water at a distance of 40 miles from the Colorado, and a number of large lagoons between the Colorado and the lake have already filled. The channel of Carter River, another old swale, has been cleared out, and is running bank full. The largest lagoon had, at the time of my information, a surface of about 100 square miles already covered with water, and as soon as the low ridge that separates it from Salton Lake is broken down, the overflow will again make its way to the latter depression. For many years the Colorado has been depositing obstructions in its own way, and it is a question of time only when the line of least resistance will lie—not towards the head of the Gulf of California, but in the direction of Salton Lake.

The Lakes of Minnesota.—In a paper by Mr. C. W. Hall, in *Science* (vol. xxi. p. 314), a short classification of the lakes in Minnesota is given. Some of these occupy rock basins, others are expansions of slow flowing rivers caused by bars of silt deposited by more rapid tributaries, and a third class are formed in hollows of the glacial drift deposit. The origin of these in gravelly ground is attributed to the washing in of fine silt, which gradually rendered the bottom watertight and retained a shallow sheet of water. The high temperature of these shallow lakes in summer leads to the vigorous growth of water-plants, which form a thick vegetable mould, and rapidly fill up the lake converting it into a meadow. Many of the lakes in which the earlier settlers in Minnesota fished or shot waterfowl, are now either covered with hayfields, or converted into extensive marshes in which the formation of soil goes on apace. The rapidity of the changes on the margin of some of the deep English lakes where circumstances favour the deposit of *débris* by rivers, enables one to understand how readily a large shallow area may be entirely converted into dry land by this means.

Travels in Peru.—Mr. A. Baraillier has published an account of a journey to Andamarca and Pangoa in the *Geographical Journal* of Lima. He started from Jarya on May 12th, 1891, and travelled to Jesus-Maria, a distance of about 168 miles. Comas, the capital of the district, is a poor place with wretched inhabitants. The region known as Chin-con (*i.e.*, intense cold) lies between Comas and Andamarca. There are marvellous legends about silver mines known only to a few shepherds, who fear to divulge their secret, since they firmly believe they will be punished with instantaneous death. The reports appeared to have some foundation, as Mr. Baraillier saw an extraordinary rich piece of ore brought by an Indian to the Hacienda of Runatullo. Andamarca is built on a kind of plateau, and has about five hundred inhabitants. Judging from the ruins, it must have seen better days, but at present there are only three or four habitable houses. Mr. Baraillier went from Andamarca to Pangoa: he travelled chiefly on foot up the stony ascent, and had to ford four rivers, *i.e.*, San José, Santiago, Playa, and Mariposa. He crossed a fifth on a natural bridge of fallen trees, and finally reached Pangoa, a hamlet lost in the immensity of Montercal. It is surrounded by small plots of land, on which are cultivated the cocoa, coffee, and tobacco plants, and the sugar-

cane; the principal products are rice and coca. The Rio Grande or Rio Pangoa runs 6 miles east of the village. On the opposite shore live the Chunchos, in low huts, and their rafts are tied at the water's edge. They are divided into two tribes, red and black, according to the colour they paint themselves with. The red are friendly, and often come to Pangoa to effect exchanges; they are tall and athletic. The black Chunchos are a race of reputed cannibals; they are constantly at war with their neighbours, and are supposed to eat their prisoners; they worship the sun, like the Incas, so they may possibly be descendants of tribes who fled away from the greedy Spanish gold-seekers. Mr. Baraillier considers Pangoa to be a ramification of the great Pampa of Sacramento, which forms the greater part of Brazil, and merges in the south into the Argentine Pampa, which extends to the Straits of Magellan. Here one recognises the two extraordinary characteristics of South America, *i.e.*, vast fertile plains, rich in agricultural products, and also mineral wealth hidden in the snow-clad and inaccessible Cordilleras. At Pangoa the most valuable trees and plants grow luxuriantly; the sugar-cane grows flowers and yields in eight months; cocoa yields four harvests a year; it is the most valuable product, and can easily be exported, by the River Pangoa, which is navigable to the mouth of the Amazon. The tobacco compares favourably with that of Havana. The fauna of Pangoa comprises every known animal, and the sight described by Mr. Baraillier of a moonlight night in the forest seems to be quite unique. Mr. Baraillier speaks of Pangoa as an earthly paradise, except for the low character of the natives, suggests that a scientific exploration should be undertaken, and that the Peruvian Government should open out roads in order to put the various towns in practical communication with each other. The region between Pangoa and Jesus-Maria is only known and inhabited by the Chunchos.

AUSTRALASIA.

Maori Names in New Zealand.—It is satisfactory to see that an effort is being made to perpetuate the euphonious native names of New Zealand, the correct forms of which are liable to be lost unless early steps are taken to secure them. In a letter to the New Zealand Institute, published in the *Auckland Standard*, Mr. J. S. Rutherford, of Whangarei, suggests that that body should prepare a map of New Zealand showing Maori names only. In urging the importance of this work and the risk of incompleteness through delay, he says:—"This would be of the greatest historical value, and, in fact, is almost the only way we can ever hope to retain the native names, and hand them on with any degree of purity. Every year past makes the task more difficult, as at all events in the southern portion of New Zealand the names are being fast forgotten, corrupted, or entirely lost, there being now only a remnant of the race living to whom an appeal can be made. When it is considered how carefully and minutely each bay and headland is named by the natives, in many cases far more appropriately than by the Europeans, who have fallen back on a clumsy repetition of names where there is no similarity of position or surroundings, and when it is remembered how often the native name is taken from some distinctive feature in the place, I think the value of such a document will be readily admitted."

The Coastland on the Gulf of Papua.—The Rev. James Chalmers contributes some notes of a journey along the coast of the Gulf of Papua to the recent numbers of the *Chronicle* of the London Missionary Society. Mr. Chalmers left Port Moresby last June for Motumotu, whence he coasted along in a whale-boat to the River Annie. He crossed the dangerous bar of the river, and anchored amid a

heavy inside swell and strong current at the village of Vailala. From Vailala a journey of about 15 miles took the party to the larger village of Orokolo, where there appeared to be a specially large and varied supply of food. As the surf at Orokolo looked dangerous next day, the boat was carried overland a distance of some 6 miles to the River Aivei. Thence a two hours' pull brought Mr. Chalmers to Apepe, a new village built by Maipuan on the west bank of the Arere River. The party left Apepe in the morning, and after a row of about 7 miles, crossed Port Blomfield, explored some distance up the Panaroa River, and crossed the mouth of the Urita in the afternoon. A halt was made up the river at the village of Koropanairu, where it was noted that, as there was no solid ground, the dead are placed on platforms in the mud beside the houses. Having crossed to the River Arai, Mr. Chalmers and his companions descended the stream to the village of Ukerave, where he had some difficulty in getting away, as he declined to burden himself with so much food as the natives wished to give in return for his presents. The natives everywhere were most friendly, and the genial missionary found them a particularly happy and humorous set of people when their suspicion of the strangers were allayed. Mr. Chalmers had been four months without letters when he wrote; he found that the deltaic channels of the Fly River would enable him to visit all the villages of the head of the gulf without going to sea, and felt keenly the want of a steam-launch, which has now been supplied.

Trade of Tahiti.—The Report on the trade of Tahiti for the year 1892, recently issued, shows a decrease during the year in both exports and imports. The exports from Tahiti, include bêche-de-mer, coffee, cotton, coconuts, vanilla, wool, wax, copra, oranges, and mother-of-pearl shell. The pearl shell fishery is an important industry of Tahiti. The Island of Tahiti, Moorea, the Leeward Islands, the Marquesas, &c., which at the present time produce only a few commodities for export, are capable of much greater agricultural development. The soil on all these islands is most fertile; they are well-watered, have good harbours, and apparently free from the scourge of gales of wind or hurricanes so injurious in most tropical countries. The lands and climate of Tahiti seem to be well adapted to the production of excellent coffee. This cultivation has already begun on a small scale in the Islands of Rurutu and Rimatara, and foreign enterprise also is at work in the Island of Tahiti. According to the census which was taken in 1887, the total population of the various islands forming the French establishments of Oceania was then twenty-four thousand four hundred and eighteen. The census taken in 1892 gives a decrease of two thousand three hundred and eighteen, which is partly accounted for by a reduction in the naval and military establishments of seven hundred and ninety-four men, and partly by a decrease in the Tahitian population.

Nine Island.—Mr. Harold Williams contributes to the March number of the *Journal of the Polynesian Society*, a vocabulary of the language of Nine, or Savage Island, supplemented by a description of the island and its inhabitants by Mr. E. Tregear. Nine is situated in the South Pacific in lat. 19° S. and long. 169° 21' W. It is about 40 miles in circumference, and is nearly of an oval shape. The natives are of the fair Polynesian type, and greatly resemble the Samoans. They still cling to some of their ancient and innocent customs. Before the introduction of Christianity they were constantly at war with each other. At the present time the character of both Nine and its people differs much from that of the past. The population numbers five thousand and seventy, half of which are children. The island produces coffee, cotton, sugar-cane, arrowroot, and yams, of the finest quality, the soil being very fertile.

POLAR REGIONS.

Dr. Nansen's Expedition.—The following telegram, dated Berlevaag, July 21st, has been received from Dr. Nansen (Berlevaag is about 60 miles west of Vardö):—Leaving Vardö for Yugor Strait, where thirty sledge dogs will meet us. Will go along the Siberian Coast eastward, past Cape Chelyuskin to Olenets River, near the Lena, where another twenty-six dogs are waiting. We then turn towards the north. We hope to reach the west coast of the New Siberian Islands in the end of August, if the ice is not bad. The latest information about ice conditions there are favourable. We shall go straight northwards until fast in the ice. If we meet new land we shall follow it along the west coast northwards; when there is no more open water we shall drift with the ice. Everything has gone on well up to the present. The *Fram* is a splendid strong ship and will stand ice pressure well. She is deeply laden with coal, but will soon grow lighter. Accounts of the ice in the White Sea and Barents Sea are not favourable; there has been much ice, but I hope it is now better, as the ice changes quickly. I have good hopes. If we only get through the Kara Sea in good time I feel certain there are good prospects of success.

Lieutenant Peary's Expedition.—Lieutenant Peary left St. John's, Newfoundland, in the early part of July for Northern Greenland, *via* Smith Sound, his main object being, it is stated, to lay down the northern coast of Greenland. Lieutenant Peary is taking with him a supply of Eskimo dogs, eight Colorado donkeys, and twenty carrier pigeons. He has taken supplies for two years, including three tons of pemmican.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Seismology in Japan.—The Seismological Society of Japan, founded in 1880, closed a brief but active life in 1892. The cause of death having been apparently not so much lack of workers as of opportunities for their meetings, the publications of the defunct Society are to be continued in journal form under the editorship of Professor Milne. Vol. I., corresponding to Vol. XVII., of the Society's transactions, has just been issued, and contains eight papers, five of which are from the editor's pen. One of these discusses in detail the earthquake statistics of Japan for the year 1890, dealing with a total of 845 shocks—a frequency considerably above the average. In the province of Higo no fewer than 207 earthquakes were recorded, mostly following on the great earthquake of July 1889. Professor Milne's other papers deal chiefly with generalised results of previous work in seismology, and their application to the mitigation of earthquake effects. In conjunction with Mr. F. Omari, Professor Milne gives an account of experimental investigations on "the overturning and fracturing of brick and other columns by horizontally applied motion," and compares the results with the mathematical formulæ deduced by Mallet and others. Professor W. K. Burton contributes some notes on the applications of photography to seismology, and Mr. F. Omari on early Chinese earthquakes.

The Contraction Theory of Earth Movements.—Dr. R. Sieger of Vienna contributes to *Ausland* some notes on Suess's theory, which attempts to explain the formation of mountains and the elevation and depression of coast-lines by the contraction of the Earth's crust from cooling. This hypothesis first gained acceptance in France, and Suess himself refers to Prévost as anticipating his views. Günther has recently drawn attention to the work of Berzelius, who found it

possible to account for the elevation of the Scandinavian Peninsula by means of the contraction-theory alone, without recourse to the supposed changes of the level of the sea, deemed necessary by some investigations. But Dr. Sieger points out that the whole case was treated from almost the same point of view, and in almost the same manner, by F. W. Johnston so long ago as 1833. In the *Edinburgh New Philosophical Journal* for that year appears a paper "On a gradual elevation of the land in Scandinavia," in which Johnston finds in the cooling of the Earth a cause which "not only suffices for the formation of mountain-ranges, but explains the general elevation of the Scandinavian Peninsula."

Martin Behaim and the Astrolabe.—Eugen Gelcich, who at the Columbus celebration at Hamburg dealt with the state of nautical science at the close of the 15th century, attempts (*Mittheilungen*, Vienna Geog. Soc., xxxvi., p. 100) to remove the obscurity which has hitherto involved the question of the part taken by Martin Behaim in the introduction of improved methods of observation at sea. Humboldt and Peschel, followed by other writers, held that the use of the cross-staff was learnt by the Portuguese from the Arabs in the Indian seas, and so introduced into Europe. Breusing, having shown that this was due to a mis-reading of a passage of Barros, pointed out that the cross-staff had been described as early as 1472 by Regiomontanus, whose pupil, Martin Behaim, attended the Junta summoned by John II. to suggest improvements in the methods of nautical astronomy, and probably carried the knowledge of that instrument into Portugal. The improvements introduced by the Junta concerned the instrument only, according to Breusing, as sufficiently accurate tables of the sun's declination already existed. In support of his argument he cited the passage of Barros which states that the Arabs used an instrument of their own, for the same observations for which the Portuguese then used the cross-staff. These views, which met with general acceptance, are rejected by Gelcich, for reasons which may be summarised thus:— (1) Barros, in describing the improvements brought in by the Junta, speaks only of *Astrolabes*, noting the greater accuracy obtained by the new method over that in which the large wooden *Astrolabes* were still used. Da Gama, who took with him a large wooden Astrolabe and smaller ones of brass, found the former untrustworthy at sea. (2) Barros wrote sixty years after the assembly of the Junta, and a correct rendering of his statement as to the use of the cross-staff by the Portuguese for a certain observation shows that he was speaking of what was the case in his day. Now we know from Nonius that the cross-staff was then not used for observation of the sun's altitude, for which it had proved unsuitable, but for that of the Pole star. (3) Neither Columbus, Magellan, nor any other navigator or writer on navigation until late in the 16th century mentions the cross-staff as used at sea. (4) Regiomontanus was not the inventor of the cross-staff, which had been described as early as the 14th century by the Spanish Jew, Levi Ben Gerson. (5) The previously existing tables involved laborious calculations, which those newly issued by Regiomontanus, probably put in a more practicable form by Behaim, would obviate. Gelcich therefore concludes that the cross-staff was not used for observing the sun's meridional altitude in Behaim's time, but that the title of the latter to distinction rests on his introduction of more handy brass astrolabes in place of the large wooden ones, and the preparation of tables which would bring the practise of navigation within the reach of a far wider circle than previously.

Ville-Timchenko's Water-Bottle.—*The Memoirs (Trudy) of the Novorossian Society of Naturalists* (vol. xvii. No. 2, 1892) contain a description of the water-bottle which was used by the Black Sea expeditions in 1890 and 1891. It is a modification of Ville's bathometer by M. Timchenko. The apparatus consists of a copper

cylinder, slightly widened in its middle, like a cask, gilded inside, and having openings at both ends. Each of the two ends is shut by a lid, attached to a screw, which is set into motion by a propeller. When the instrument goes down, the two propellers rotate one way and extend the screw till they have thrown the two lids wide open, so that water freely passes through the instrument. But when it is pulled upwards, the propellers, turning the other way, at once shut the valves. The cylinder, the stoppers, and the propellers are placed in another wider cylinder. The apparatus has been well tested, and is considered as fully trustworthy. It has received the name of Ville-Timchenko's bathometer.

Denudation in Deserts.—At the tenth meeting of German geographers (Stuttgart, April 1893), Prof. Dr. Walther of Jena read a paper on denudation in deserts. He showed that the customary views which we have of a desert are often quite different from the actual physical features of such countries. Denudation consists of two different factors, viz., the decomposition of the surface, and the removal of the decomposed products. If decomposition is but small, the transporting agents need not be of great force in order to remove all the products of the former. But in many cases these products are very considerable, as even the hardest rocks may be decomposed by physical influences, such as insolation and great and sudden changes of temperature, or by chemical reagents which prevail chiefly in deserts where the amount of sand is but limited. Rain is of rare occurrence in deserts, and its influence upon denudation is only of subordinate importance. Much more vigorous transporting agents are the winds which often blow with great force; but rocks are worn and destroyed much less by the mere friction of sand-laden winds, than by deflation, the effects of which are the important factors of denudation, wherever the transporting force of the winds surpasses the action of the water. Prof. Walther, who has made the study of deserts his speciality, proved his statements by many observations which he had made in the Sahara, on the Sinaitic Peninsula, and in the deserts of North America.

GENERAL.

Instructions for Travellers.—At a meeting of the Professors of the Paris Natural History Museum, it was decided to form for the year 1893 a course of special instruction for travellers. The advantage of a similar institution had been recognised by the naval authorities, who in 1886 had requested Professor Pouchet to draw up a treatise on the “*Récolte des objets d’histoire naturelle à la mer.*” In the Museum this teaching had for a long period actually been established and had progressively developed before receiving official consecration. In 1876 Professor Hamy had started a series of lectures, which are still continued, and which were attended by many travellers, among whom may be mentioned, MM. de Brazza and Harmand. To special instruction in anthropological research M. Hamy had added a few lessons in photography, lessons which he proposed to continue this year. The learned professor will thus fill up a more apparent than real blank in the syllabus. Besides, the example of the professor of Anthropology had been followed by Professor Bureau. The new instruction is to be essentially practical. The professors will aim at giving merely *simple* directions to their students, and at showing them none but easy manipulations, which could be carried out where no laboratory is available. They only intend to teach travellers how to gather and how to preserve collections, and how to avoid overburdening themselves with worthless objects. Thus many a disappointment will be saved. Demonstrations in the laboratories will teach how to practically apply what is learnt in the lectures; special attention will be devoted to the collection of specimens in the

field. Thus M. Charles Brongniart will take his students in the neighbourhood of Paris to gather insects; while M. Ramond will show them how to draw up a geological section. In a word the purpose of this course of lectures is to enable the traveller to collect usefully for science. Let us hope that this attempt will lead to the formation of a real school of *travellers* who are *naturalists*, and for whom the publication of the lessons given in 1893 would immediately prove a most valuable guide. The first course was given from April to June last, and included the following:—Opening Lecture, Prof. Milne-Edwards; Anthropology, Prof. Hamy; Ethnography, Prof. Verneau; Mammiferous Animals, Prof. Oustalet; Fishes and Reptiles, Prof. Vaillant; Birds, Prof. Oustalet; Compared Anatomy, Prof. Pouchet; Worms and Zoophytes, Prof. Bernard; Insects and Crustaceans, Ch. Brongniart; Molluscs, Prof. Perbier; Botany (phanerogams), Prof. Bureau, Botany (cryptogams), Van Tieghem; Living Plants, Prof. Cornu; Paleontology, Prof. Albert Gaudry; Geology, Prof. Stanislas Meunier; Meteorology, Prof. Danie; Berthelot; Mineralogy, Prof. Lacroix; Travellers' Hygiene, Prof. Gréhant. During the practical lectures given in the laboratory, or in the field, the students were initiated into the art of gathering and of preparing collections.

The Navy Records Society.—A society, newly formed, under the name of the Navy Records Society, proposes to print rare or unpublished works relating to the Navy, with the aim of establishing the history of our Navy on a sure foundation. Their Royal Highnesses the Duke of Edinburgh and the Duke of York are patrons of the Society, and Earl Spencer, the present First Lord of the Admiralty, is the president. It should be understood that the Society is neither exclusively nor, indeed, mainly, naval in its constitution; and that any person, library, or club, approved by the Council is eligible as a member. Application should be made to the Secretary, Professor Laughton, at Catesby House, Manor Road, Barnet. The first publications will most probably be papers relating to the war with Spain, 1587–8, edited by Mr. J. K. Laughton; and Hood's letters, 1780–3, edited by Mr. D. Hannay.

CORRESPONDENCE.

The "Island of Sultana."

SEA PARK, WICKLOW, July 10th, 1893.

I have two copper coins of the East India Company, dated respectively 1805 and 1835, which in addition to the arms and supporters of the Company and the date, bear the words "Island of Sultana." I have made many inquiries both from numismatists and geographers, and so far have been able to obtain no trustworthy information as to the whereabouts of this island. The maps of the Society have been hunted over in vain, but the name cannot be found. The theory among numismatists is that the name refers to Sumatra or Labuan. I should be greatly obliged to any Fellow of the Society or reader of the *Journal* who will kindly give me any definite information as to where the island is, or, if it has been rechristened, what its present name is.

H. LESLIE ELLIS.
Lieut.-Col.

Hannibal's Vinegar.

16, TRINITY ROAD, TULSE HILL, July 11th, 1893.

Whilst in Colombo in March last in the course of a trip to the East my attention was accidentally directed to a substance called "Cabook,"

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which is used extensively there for building purposes, taking the place of brick.

I was told that "Cabook" is decayed rock, and is found both on the surface and below the soil. It hardens in the sun, and is usually limed over when used for building houses. It is said to be a favourite substance with burglars, as it offers little resistance to their attacks.

Burglars, said my informant, having selected a house on which to operate, bring with them a chatty containing one or two quarts of vinegar. They remove the lime and puddle the vinegar on to the "Cabook," a process which softens it and makes it like mud. They are then able with an iron tool to work a hole through the "Cabook" and into the building, the whole process, in many instances, lasting not more than fifteen minutes.

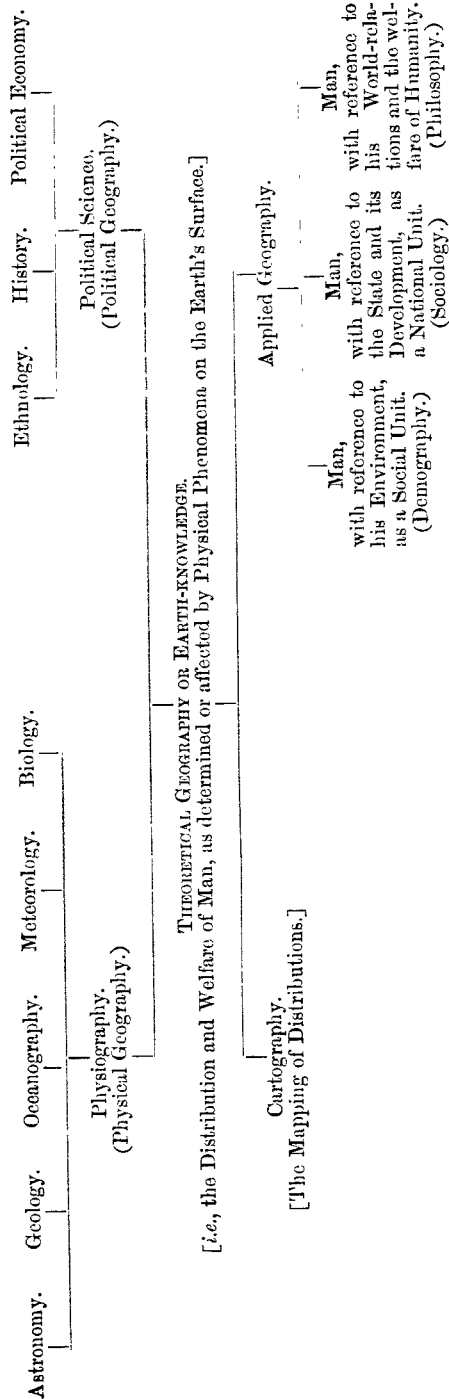
The incident seemed to me to throw some light on this discussion, and to show the possibility at least of Livy's story, and it is a curious confirmation of the extract from Dion Cassius, quoted at p. 175, Vol. I. of *The Geographical Journal*. It may, however, be already well known to you, so I give it with all possible diffidence.

S. HORACE CANDLER.

The Position of Geography in the Cycle of the Sciences.

In the accompanying Table I have endeavoured to define the position occupied by Geography in the Cycle of the Sciences. If these relations between Geography and the allied sciences were clearly understood, it would be helpful both to teachers and students, and lay the basis for the construction of a text-book on Theoretical or Scientific Geography, which, in my opinion, has yet to be written. It is true that there are and have been writers on Geography who have treated their subject-matter in a thoroughly scientific manner, and there are others who have clearly explained what Geography is *not*. What we want, however, is a clear exposition of the field and scope of Geography and of its relation to other sciences. If any such exposition has been made it is unknown to me, though I am aware that in Germany and elsewhere the science of Geography is thoroughly understood and has been exhaustively criticised.

In this country Geography is discredited because it is imperfectly understood and inadequately taught; it is regarded as a *graphy* and not as an *ology* at all. The reason of this is because Geography is used merely as a vehicle of description and not as a body of thought. No tax is laid on the reasoning powers of the student, and therefore the subject, in its empirical aspect, is all but worthless in any system of education. Although general principles are understood and applied, as pertaining exclusively to the department of Geography, they have not yet been grouped and classified, far less have they been embodied in any published system of teaching. Teachers, for the most part, have had to evolve a system for themselves—a system that is liable to error on account of the personal equation. What they require is what all established sciences already possess, a standard text-book that very clearly defines the principles of Geography and their practical application, for Geography has both a practical and a theoretical side. All else, so far as Scientific Geography is concerned, must either encroach upon other sciences or be a disjointed and an eclectic epitome of them.



Geography is shown in the above Table to draw its facts from eight elemental or derivative sciences, and to group these facts under two divisions, from which general principles are deduced. This forms the Theoretical side of Geography. Its Practical side is sub-divided under two heads: (1) Cartography, in itself a distinct science, involving Mathematics; and (2) Applied Geography, which takes account of Man in his three characteristic aspects—towards his Home, towards the State, and towards the World—and considers them in conjunction, their more precise definition being left to three other sciences for separate treatment.

ARTHUR SILVA WHITE.

OBITUARY.

Sir George Tryon, K.C.B.—While, by the appalling catastrophe of the *Victoria*, the country lost, in Sir George Tryon, one of its most valued and accomplished servants, this Society has been deprived of a highly-prized associate who had been one of ourselves for more than a quarter of a century.

George Tryon was of an ancient Northamptonshire stock, the third son of Thomas Tryon Esq., of Bulwick Park by Anne, daughter of Sir John Trollope, Bart., and sister of the first Lord Kesteven. Born in January, 1832, he entered the Navy in 1848, after a longer period of schooling than fell to the lot of most young naval officers in those days. He began his career on the West Indian station, under the auspices of Admiral the Earl of Dundonald, the renowned Lord Cochrane of Basque Roads. After two years he was transferred to the Mediterranean, being employed as midshipman on board the *Vengeance*, under Captain Lord Edward Russell, at the breaking out of the Crimean war. He went thence to the *Britannia*, the flag-ship of Admiral Sir Deans Dundas, and served in the Naval Brigade before Sebastopol, when he was wounded, and at the capture of Kinburn. After the peace Tryon remained on board the *Royal Albert*, the flag-ship of Lord Lyons, and he was promoted to the rank of lieutenant for his war services, in October, 1854. Four years afterwards he was selected for the Royal Yacht, which insured him his commander's step after two years.

Thirty years ago that great revolution in the constructive department of our navy was commenced, before which the wooden walls of old England were destined to disappear. The first ironclad was the *Warrior*, commissioned by our associate Captain the Honourable Arthur Cochrane, in 1861; and it is no small tribute to the brilliant attainments of George Tryon that he should have been selected as Commander of the *Warrior*, serving under the son of his old Admiral, Lord Dundonald. He was only twenty-eight years of age, and had just been promoted to his commander's rank. After some years in the *Warrior* she was paid off, and Tryon was appointed to the *Surprise* in the Mediterranean. He was, through life, an ardent sportsman, and during this commission he had many opportunities, on the coast of Albania and elsewhere, of indulging in his favourite pursuit.

Tryon attained his post-rank in April, 1866, and two years afterwards he was specially selected by the Treasury to organise and superintend the transport department during the Abyssinian war. When he arrived in Annesley Bay he found everything in a chaotic state. But he had a genius for organisation, attending personally to every detail, and seeing himself that all his orders were carried out as he intended. The transport service became regular and efficient under his hands, and the value of his work was recognised by the Government. He was created a Companion of the Bath. Although he was strict in enforcing obedience to his regulations, and sometimes even severe, his considerate kindness and genial manner won him the respect and regard of the numerous body of transport captains, who presented him with a handsome piece of plate after the close of his service in Annesley Bay.

In 1869 Captain Tryon was married to the Honourable Clementina C. Heathcote, daughter of the first Lord Aveland, her mother being 21st Baroness Willoughby d'Eresby in her own right. They rented Tickhill Castle in Yorkshire for a short time; but such an officer as Tryon could not be allowed to remain long unemployed. He was Private Secretary to Mr. Goschen at the Admiralty from 1871 to 1874, and in the latter year he commissioned H.M.S. *Raleigh* for a three years' service in the Mediterranean. From 1878 to 1881 Captain Tryon com-

manded H.M.S. *Monarch* on the same station, serving on the coast of Tunis at the time of the French occupation, and acting as a member of the Sfax enquiry commission. He was specially complimented by the Admiralty on the admirable order of the *Monarch* when that ship was paid off in 1881.

Tryon was now looked upon as one of the most prominent officers in the navy. A thorough seaman and able diplomatist, he was also a skilful organiser, and he had acquired considerable administrative experience at the Admiralty. He was a man of strong personality, and exercised great influence over the minds of others. From 1882 until he attained flag-rank in 1884 he held the important post of Permanent Secretary to the Admiralty, and since 1878, or before, his mind had been specially turned to the questions connected with fleet manœuvres and tactics. His decided inclination was to the side of that school of thought, in the navy, which was less in favour of exact experiment with individual ships, and more disposed to rely upon the eye and the judgment, and on plenty of practice in the conduct of fleet manœuvres. Many other questions bearing on the welfare of the navy exercised his thoughts and occupied his pen at this time.

In 1884 Tryon became a rear-admiral, and went out as commander-in-chief on the Australian Station with H.M.S. *Nelson* as his flag-ship. During the next three years he did most important service in organising the system of local naval defence for the Australian colonies, and, in his position as admiral, in doing his best to draw closer the ties between the colonies and the mother country. Returning home, it was a national loss that his candidature for the Spalding division of Lincolnshire should have been unsuccessful; for his knowledge on naval and colonial questions would have been most valuable in the House of Commons. In 1887 he was created a K.C.B., and in the following year he was appointed Superintendent of Naval Reserves, a post which he held for three years. Here his talent for organisation had an excellent field for its exercise, while his ability as a naval tactician was displayed during the manœuvres of 1888, 1889, and 1890. While Superintendent of Naval Reserves he became a vice-admiral, and in September, 1891, he was appointed commander-in-chief of the Mediterranean fleet, with his flag on board H.M.S. *Victoria*. He had held that honourable position for a year and nine months at the time of his lamented death on June 22nd. The feeling of those who had the privilege of serving under him is well expressed in the concluding paragraph of the despatch from Admiral Markham reporting the disaster, where he refers to "the great and irreparable loss that the navy and the nation have sustained in the death of our beloved commander-in-chief, Sir George Tryon, K.C.B., whose kindness of heart, no less than his signal ability in that profession of which he was such a distinguished ornament, had endeared him to all who served under his command."

Sir George Tryon became a Fellow of this Society in 1867, soon after he obtained post-rank and just before he went out to Abyssinia. He continued to take a friendly interest in the welfare of the Society, and he twice very nearly became a member of our Council. But he felt that he would be unable to devote that amount of time to the duties which he invariably gave to everything he undertook. It must, however, always be recognised that the large number of our Fellows who are, like Sir George Tryon, unable from their other occupations, to take an active part in our affairs, still form a most valuable section of our body. The interest they take in geographical science is extended to others who are under their influence, and the welfare of the Society, and of the science to which it is devoted, is thus quietly, but surely and continuously promoted by them. In the loss of so distinguished and so influential a Fellow, while we share the sorrow of the whole nation, we thus have special reason for regret. Sir George's grasp of the subjects that interested him, and

his conversational powers, which were of a high order, caused his influence to be widely felt. But his memory is endeared to all who served under him, by his generosity, his large-heartedness, and his considerate treatment of officers who were in trouble. When a very distinguished officer recently had an accident with his ship, he entered Sir George Tryon's room, for his first interview afterwards, in fear and trembling. When he came out he was heard to say—"One would have thought that it was the Admiral who was in trouble, and not me." His last wish was that no one should be unjustly blamed for his error, and his last most noble words expressed that wish. Sir George Tryon had a numerous circle of attached friends who will deeply feel his loss. Many an act of warm-hearted kindness will be remembered by them; and among others the present writer may venture to express his grief at the loss of a very old friend, and his admiration of the noble and generous character whose memory will long remain with us. C. R. M.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Fourteenth Ordinary Meeting, June 26th, 1893.—General R. STRACHEY, R.E., C.S.I., F.R.S., Vice-President, in the Chair.

ELECTIONS:—*John Barker, C.E.; John Edward Blunden; Harold Michell Courage; Thomas Robert Dewar; General Mathew Gosset; C. B. Graves; W. H. Grenfell, M.P.; Captain E. S. Guilding, D.A.A.G.; G. H. Hodges, J.P.; T. Elliott Lochner; J. Sadler-Wood; William Henry Sheppard; Gilbert Stevenson; Henry W. Taunt; Thomas J. T aylor; Thomas Tweddell; Theodore Uzielli.*

The Paper read was:—

"Kurdistan." By Captain F. R. Maunsell, R.A.

There was an exhibition of photographs, maps, botanical specimens, &c., in the tea-room.

Special Meeting, July 3rd, 1893.—General R. STRACHEY, R.E., C.S.I., F.R.S., Vice-President, in the Chair.

ELECTIONS:—*C. B. Barnes; R. B. Barron; William John Bowden; W. Orr Duncan; Colonel W. Everett, C.M.G., A.A.G.; Edward Arthur FitzGerald; Captain Richard Ford (late Rifle Brigade); James Herbert Hugh Harrison; Ralph Head; O. H. Howarth; Frederick Hall Kirby; Lieut. G. M. Kirkpatrick, R.E.; David Harry Leverson; Bruce Morison; William H. Mullens, M.A.; Colonel A. Paget (Scots Guards); Parke Mayhew Pittar; Douglas Parker; Alfred Parminter; Thomas Redmayne, M.A., M.D.; Septimus Rivington; Lt.-Colonel Herbert Anthony Sawyer, I.S.C.; Arthur Serena; Joseph Vaughan Turner; Richard Wyndham Vaughan, C.E., &c.; Ernest Edward Wild, B.A., &c.*

The Paper read was:—

"Journeys in the Pamirs and Central Asia." By the Right Hon. the Earl of Dunmore.

There was an exhibition of paintings, objects of natural history, and curios in the tea-room.

Special General Meeting, July 3rd, 1893, General R. STRACHEY, C.S.I., F.R.S., Vice-President, in the Chair.

This meeting was summoned by the Council by the following notice, which was sent to all Fellows in the United Kingdom:—

June 19th, 1893.

In order to give effect to the understanding come to at the Anniversary Meeting, that an early date should be fixed for calling a Special General Meeting to consider the proposal made by the Earl of Mayo to the effect that ladies should be admitted as Ordinary Fellows, the Council now give notice that a Special General Meeting for the above purpose will take place on Monday, July 3rd, at 3.30 P.M., at the University of London, Burlington Gardens (by permission of the Senate).

At this meeting the Earl of Mayo will move the following resolutions:

Chap. II., para. 1, of the Society's Regulations.

"To add at the end of the paragraph the words, 'Ladies are eligible as Ordinary Fellows.'"

Interpretation clause to be added at end of Rules:

"Whenever required in these Regulations or the Appendix thereto, words importing the masculine gender only shall include the feminine gender."

The following amendment to Lord Mayo's resolution will be proposed by Mr. William Hicks:

"That without expressing any opinion as to the status of those ladies already elected by the Council, this Meeting of the Royal Geographical Society considers it inexpedient to admit ladies as Fellows."

It is the hope of the Council that all Fellows able to do so will attend the meeting, and that any decision come to may be regarded as conclusive, and will not be further challenged.

The Council being desirous that the question shall be decided in conformity with the wishes of the Fellows at large, have abstained from adopting any resolution upon it in their collective capacity, reserving, however, to all of their number free exercise of their individual opinions.

DOUGLAS W. FRESHFIELD } *Hon. Secs.*
H. SEEBOHM }

After some introductory remarks by the Chairman, the Earl of Mayo moved the resolutions of which he had given notice, viz., in Chapter II., paragraph 1, of the Society's Regulations, "To add at the end of the paragraph the words 'Ladies are eligible as Ordinary Fellows.'" Interpretation clause to be added at end of Rules—"Whenever required in these Regulations, or the Appendix thereto, words importing the masculine gender only, shall include the feminine gender."

Sir Frederick Young seconded Lord Mayo's motion.

Mr. William Hicks moved the amendment, of which he had given notice, viz. :—

"That without expressing any opinion as to the status of those ladies already elected by the Council, this Meeting of the Royal Geographical Society considers it inexpedient to admit ladies as Fellows."

This amendment was seconded by Admiral Sir Vesey Hamilton.

The Chairman ruled that as Mr. Hicks's amendment was a direct negative to Lord Mayo's motion, the latter should be put first.

On the vote being taken, the result was announced by the Chairman as follows:

In favour of Lord Mayo's motion ..	..	..	..	..	158
Against ..	..	..	..	..	172
Majority against ..	..	..	..	..	<u>14</u>

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A = Academy, Academie, Akademie.
 Ann. = Annals, Annales, Annalen.
 B. = Bulletin, Bollettino, Boletim.
 Com. = Commerce, Commercial.
 C. R. = Comptes Rendus.
 Erdk. = Erdkunde.
 G. = Geography, Geographie, Geografia.
 Ges. = Gesellschaft.
 I. = Institute, Institution.
 J. = Journal.
 M. = Mitteilungen.

Mag. = Magazine.
 P. = Proceedings.
 R. = Royal.
 Rev. = Review, Revue, Revista.
 S. = Society, Société, Selskab.
 Sitzb. = Sitzungsbericht.
 T. = Transactions.
 V. = Verein.
 Verh. = Verhandlungen.
 W. = Wissenschaft, and compounds.
 Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is $10 \times 6\frac{1}{2}$.

EUROPE.

Alps. *Deutsche Rundschau* 15 (1893): 433-437. **Böhm**
 Eintheilung der Alpen. Von Dr. August Edlen v. Böhm. *With map.*

Austria—Geology of Tyrol. **Ogilvie.**
 Contributions to the Geology of the Wengen and St. Cassian Strata in Southern Tyrol. By Maria M. Ogilvie, B.Sc. [*From the Quarterly Journal of the Geological Society*, vol. xlix. (1893), p. 1.] *With maps and sections. Presented by the Author.*

Italy—Monti Pisani. *Le Globe, Bull.* (1893): 217-233. **d'Arcis.**
 Les Monts pisans, M. Arthur d'Arcis.

The Monti Pisani are a small chain of mountains situated to the north-east of the town of Pisa.

Portugal. **Vasconcellos**
 Sur les Religions de la Lusitanie.—Sur les Analistes portugaises. Abrégé de Mémoires destinées à la 10^e Session du Congrès international des Orientalistes. Par J. Leite de Vasconcellos. Lisbonne, Société de Géographie, 1892. *Presented by the Geographical Society of Lisbon.*

Notes on the religions of the peoples inhabiting the countries in the west of the Spanish Peninsula, from the most ancient times to the establishment of Christianity, with indications of the geographical distribution of some of the most important monuments.

Portugal—Place Names. **Vianna.**
 Deux faits de Phonologie historique portugaise. Mémoire présentée à la 10^e Session du Congrès international des Orientalistes. Par A. R. Gonçalves Vianna. Lisbonne, Société de Géographie, 1892. *Presented by the Geographical Society of Lisbon.*

Some observations on the old pronunciation of Portuguese words and rules for transliteration into Portuguese of Arabian names, and orthography and pronunciation by the Arabs of place names.

Scandinavia. *Z. Ges. Erll. Berlin* 28 (1893): 1-122. **Sieger.**
 Seenschwankungen und Strandverschiebungen in Skandinavien. Von Dr. Robert Sieger.

An elaborate work on earth-movements in Scandinavia.

Spain.**Fabricius.**

La première invasion des Normands dans l'Espagne musulmane en 844.—
La connaissance de la Péninsule espagnole par les Hommes du Nord.
Mémoires destinées à la 10^e Session du Congrès international des
Orientalistes. Par le Professeur Adam Kristoffer Fabricius. Lisbonne,
Société de Géographie de Lisbonne, 1892. *Presented by the Geographical
Society of Lisbon.*

These memoirs are the subject of a special review.

United Kingdom—Trade. *J. R. Statistical S.* 56 (1893): 185–214.

Bourne.

Progress of the External Trade of the United Kingdom in Recent Years.
By Stephen Bourne.

ASIA.**Armenia.***Globus* 63 (1893): 349–352.**Belck.**

Untersuchungen und Reisen in Transkaukasien, Hoch-Armenien und
Kurdistan. Von Dr. Waldemar Belck. *Map.*

India—Irrigation.**Buckley.**

Irrigation Works in India and Egypt. By Robert Burton Buckley,
Superintending Engineer, Indian Public Works Department. London,
E. & F. N. Spon, 1893: size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. xvi. and 348. *Many maps and
plates.* Price £3 3s. *Presented by the Secretary of State for India.*

This large volume gives details regarding the methods of irrigation employed in
India and Egypt, the various works being minutely described by the aid of numerous
sectional diagrams, and by maps of the regulated rivers and canals. The large-scale
maps of river-basins and deltas give a certain geographical value to the book apart
from its importance as a contribution to engineering literature.

India, Punjab—Ambala District.

Gazetteer of the Ambala District, 1892–93. Compiled and published under
the authority of the Punjab Government, 1893: size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. v., 156,
and xliii. *Presented by the Secretary of State for India.*

India, Punjab—Hissar District.**Fagan.**

Gazetteer of the Hissar District, by P. J. Fagan, 1892. Compiled and
published under the authority of the Punjab Government. Lahore, 1893:
size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. vi., 299, and xlii. *Presented by the Secretary of State for
India.*

Madras Observations.**Smith.**

Results of Observations of the Fixed Stars made with the Meridian Circle
at the Government Observatory, Madras, in the years 1877, 1878, and
1879, under the direction of the late Norman Robert Pogson, C.I.E., F.R.A.S.
By C. Michie Smith, B.Sc., etc. Vol. vi. Madras, 1893: size 11×9 ,
pp. xxvii. and 350. *Presented by Mr. C. Michie Smith.*

Mongolia.*J. Asiatique*, 9, 1 (1893): 290–336.**Bretschneider.**

Itinéraires en Mongolie. Par M. E. Bretschneider, traduit du Russe par
M. Paul Boyer.

This is a French translation of an article written by M. Bretschneider in December
1889 to serve as an introduction to the paper of the Archimandrite Palladius, published
by the Russian Geographical Society.

Mount Sinai.*Imp. Asiat. Quarterly Rev.* 6 (1893): 149–158.**Sayce.**

Where was Mount Sinai? By Prof. A. H. Sayce.

Prof. Sayce is of opinion that the true Mount Sinai was situated on the borders
of Midian and Edom among the ranges of Mount Seir, not in the Sinaitic Peninsula.

Palestine—Lebanon.**Post.**

Quarterly Statement, Palestine Exploration Fund, July, 1893, 219–239.

Narrative of an Expedition to Lebanon, Anti-Lebanon, and Damascus.
By Rev. George E. Post, M.D.

Turfan.*Globus* 63 (1893): 381–385.**Hahn.**

Grum Grschimales Forschungen in Turfan (Centralasien) Mitgeteilt von
C. Hahn, Tiflis.

AFRICA.

African Names. *Rev. G. 32* (1893): 450-456. **Savin-Desplaces.**

L'Orthographe des Noms Africains. Par L. Savin-Desplaces.

Calling attention to the inconsistencies in spelling African place-names, with special reference to French usage.

African Travels. **Colville.**

Round the Black Man's Garden. By Zélie Colville, F.R.G.S. With illustrations from drawings by the Author and from photographs. Edinburgh and London, William Blackwood & Sons, 1893: size $8\frac{1}{2} \times 6$, pp. xvi. and 344. Price 16s. Presented by the Author.

Mrs. Colville's journey described in this volume was in many respects an unusual one. With her husband, Colonel Colville, she left Europe in September 1888 for a journey of seven months' duration, and embarking at Suez on an Egyptian steamer visited several of the Red Sea Ports, including Suakin, during its bombardment, Massawa, where she saw the solid results of Italian enterprise, Hodeida, and Aden. At Aden they took a French steamer to Tamatave, calling at East African ports. The most novel and interesting part of the journey was that across the Island of Madagascar through Antananarivo to Mojanga. Thence a French merchant took them across to Mozambique, where a coasting steamer was found for Durban. Through Natal by rail and the Transvaal by coach they ultimately reached Kimberley and Cape Town. Here a difficulty presented itself, as they wished to complete the tour of Africa by visiting the west-coast colonies, with which there was no direct communication. At length they decided to go to the Canaries, where a West-African coaster picked them up and enabled them to visit every place of importance on the Guinea Coast as far south as the mouth of the Gabun. Mrs. Colville has described her observations with great literary skill, and produced a work of much higher merit than the average globe-trotter's diary.

African Volcanoes. *Deutsche G. Blätt. 16* (1893): 105-127. **Meyer.**

Die Grossen Bruchspalten und Vulkane in Aequatorial Africa. Von Dr. Hans Meyer.

An attempt to give a general view of the part played by volcanic agencies in determining the configuration of the continent.

British East Africa. *Imp. Asiat. Quarterly Rev. 6* (1893): 106-122. **Parry.**

The Capabilities of Eastern Ibea. By Francis Parry, F.R.G.S.

Cape of Good Hope—Statistics.

Statistical Register of the Colony of the Cape of Good Hope for the year 1892, with Supplement for March Quarter, 1893. Cape Town, 1893: size 13×8 , pp. x. and 332, diagram. Presented by the Colonial Secretary, Cape of Good Hope.

Dahlak Island—Inscriptions. *J. Asiatique, 9, 1* (1893): 77-111. **Basset.**

Les Inscriptions de l'Île de Dahlak, par M. René Basset.

The Dahlak Islands are situated in the Red Sea to the east of Massawa.

East Africa. *Petermanns M. 39* (1893): 62-66, 82-85, 97-102. **Wagner.**

Die hypsometrischen und meteorologischen Ergebnisse der dritten ostafrikanischen Expedition von Dr. Hans Meyer im Jahre 1889. Von Dr. Ernst Wagner in Breslau.

East Africa. *Scottish G. Mag. 9* (1893): 337-347. **Grant.**

The Anglo-Portuguese Delimitation Commission in East Africa. By Captain S. C. N. Grant, R.E.

German East Africa. *M. Forsch. Deutsch. Schutzgeb. 6* (1893): 69-86. **Behr**

Die Völker zwischen Rufizi und Rovuma. Von H. F. v. Behr.

Katanga. *B.S.R. Belge G. 17* (1893): 105-163. **Du Fief.**

J. Du Fief. Les expéditions belges au Katanga. With sketch map.

Liberia. *Ausland* (1893): 348-350, 355-357. **Horn.**

_____ Gegenwart und Zukunft der Negerrepublik Liberia. Von E. Horn.

- Morocco.** *Nautical Mag.* (1893): 593-608. **Broadbent.**
Morocco, The Straits, and France. By F. L. Broadbent.
- Northern Africa—Lake Chad.** *Rev. Française* 18 (1893): 12-16. **Demanche.**
La Route du Tchad et les prétentions Allemandes. Georges Demanche.
- Senegal.** *B.S.G. Com. Bordeaux* 16 (1893): 212-221, 225-248. **Rançon.**
Penetration au Soudan. KonkoJougou et Sintedougou. Par le Dr.
Rançon. *With map.*

NORTH AMERICA.

- America—Discovery.** *National G. Mag.* 5 (1893): 1-20. **Hubbard.**
Discoveries of America. Annual Address by the President, Hon.
Gardiner G. Hubbard.
Fresh discussion of a well-worn theme, illustrated by reproductions of maps.
- Mexico—Mt. Orizaba.** *Science* 21 (1893): 253-257. **Scovell.**
Mount Orizaba, or Citlaltepetl. By J. T. Scovell. *With illustrations.*
- United States—Colorado.** **Chapin.**
The Land of the Cliff-dwellers. By Frederick H. Chapin. Boston,
Appalachian Mountain Club, 1892: size 8 × 5½, pp. x. and 188. *With*
67 illustrations. *Presented by the Appalachian Club.*

A brief historical account of exploration in Colorado, and a more detailed description of the remains of the cliff-dwellers in the San Juan region, the Mancos, Acowitz, Cliff and Navajo cañons and the Mesa Verde. Most of the descriptions are from the author's personal observations.

- United States—Cotton Growing.** **Mell.**
Report on the Climatology of the Cotton Plant. By P. H. Mell, PH.D.
(Bulletin No. 8, Weather Bureau, U.S. Department of Agriculture).
Washington, 1893: size 9½ × 6, pp. 68. *Map and diagrams. Presented by*
the U.S. Weather Bureau.

- United States—Harbours.**

Annual Report of the Chief of Engineers United States Army to the
Secretary of War for the year 1892. In four parts with atlas. Washington,
1892: size 9½ × 6, pp. 3546 and index 24. Atlas 12 × 9½, 185 plates.
This comprehensive report gives full details of the engineering works carried out
during 1892 on the various harbours and navigable rivers of the United States
copiously illustrated by plans, sections and views.

- United States—Minnesota.** *Science* 21 (1893): 314-315. **Hall.**
The Formation and Deformation of Minnesota Lakes. By C. W. Hall.
Minneapolis.

- United States—Minnesota—Mammals.** **Herrick.**
The Mammals of Minnesota. A Scientific and Popular Account of their
Features and Habits. By C. L. Herrick. Minneapolis, Harrison & Smith,
1892: size 9½ × 6½, pp. 299. *Illustrations. Presented by the Geological*
and Natural History Survey of Minnesota.

Forms Bulletin No. 7 of the Geological and Natural History Survey of Minnesota

CENTRAL AND SOUTH AMERICA.

- America, South.** **Ford.**
Tropical America. By Isaac N. Ford. London, Edward Stanford, 1893:
size 9 × 6, pp. xiv. and 410. *Illustrated. Price 10s. 6d. Presented by*
the Publisher.

Mr. Ford describes Rio de Janeiro after the revolution of 1889, and then records his impressions on a journey which led him through Montevideo, Buenos Ayres, across the Andes, to the coast towns of the Pacific slope, then to the West Indies, and finally to Mexico. The observations throughout are from the standpoint of a citizen of the United States fully convinced of the sacredness of the Monroe Doctrine, and deploring the commercial supremacy of Europe in South America.

America, South.*Ann. G.* 2 (1893): 65-91, 365-398.**Gallois.**

Etat de nos connaissances sur l'Amerique du Sud. Par L. Gallois, professeur de Géographie, Lyon.

A summary of the advances in our knowledge of South America during the present century.

Ecuador.**Wolf.**

Geografia y Geologia del Ecuador. Publicada por orden del Supremo Gobierno de la Republica por Teodoro Wolf, Dr. Phil. Leipzig, Brockhaus, 1892: size 11 x 8, pp. xii. and 672. *Price with map in four sheets* 24s.

A copiously illustrated volume dealing in detail with the topography, geology meteorology, and biological distributions of Ecuador, with a chapter on the Galapagos Islands. It will be specially reviewed.

Haiti.**Rouzier.**

Dictionnaire géographique et administratif universel d'Haïti illustré. . . ou Guide Général en Haïti. Par S. Rouzier. [Tome I., A.—F.]. Paris, C. Blot [1891]: size 10 x 6½, pp. xvi. and 393. *Maps and illustrations.* Price 15s.

This work, when completed, will form an important addition to our knowledge of a little-known part of the world.

AUSTRALASIA AND PACIFIC ISLANDS.**Australian Exploration.****Tietkins.**

Journal of the Central Australian Exploring Expedition, 1889, under the command of W. H. Tietkins. Adelaide, Bristow, 1891: size 8½ x 5½, pp. 84. *Map.*

Caroline Islands—Ponape.*B.S.G. Madrid* 34 (1893): 7-63.**Caberga**

La Isla de Ponapé. Por el medico militar A. Caberga.

A geographical and ethnographical description of Ponape with a map of the island which is one of the 652 comprised in the Caroline Group of the Western Pacific.

New South Wales.*Records Geol. Survey, N.S.W.* 3 (1893): 80-85.**Etheridge.**

Ideographic Carvings of the Aborigines at Point Piper, Rose Bay, Port Jackson, &c. By R. Etheridge, junr. *With plate.*

New South Wales—Rainfall.**Russell.**

Results of Meteorological Observations made in New South Wales during 1890. Under the direction of H. C. Russell, B.A., C.M.G. Sydney, Potter, 1892: size 10 x 6½, pp. 140. *Map.* Price 3s. 6d.

Results of Rain, River, and Evaporation Observations made in New South Wales in 1891. Same director and publisher. Size 10 x 6½, pp. 152. *Map.* Price 3s. 6d. *Presented by the Agent-General for New South Wales.*

Pacific—Cocos Island.*Rev. de G.* 16 (1893): 349, 416; 17 (1893): 34-41.**Lièvre.**

D. Lièvre: Une île déserte du Pacifique. L'île des Cocos (Amérique). *With map and illustration.*

Philippine Islands—Negritos.*M. k.l. G. Ges. Wien.* 36 (1893): 329-331.**Blumentritt.**

Die Negritos am Oberlaufe des Rio Grande de Cagayan. Nach den Missionsberichten des P. Fray Buenaventura Campa. Von Professor Ferdinand Blumentritt.

Queensland Directory.**Fugh.**

Fugh's Almanac, and Queensland Directory, for 1893. Brisbane, Gordon and Gotch, 1893: size 7½ x 5, pp. xxxvi. and 194, 286, 328, *map and plan.* *Presented by the Under Colonial Secretary, Brisbane, Queensland.*

POLAR REGIONS.

- Arctic Regions.** *Goldthwaite's G. Mag.* 5 (1893): 165-169. **Schwatka.**
The Commerce of the Arctic Regions. By Lieut. Frederick Schwatka.
- Spitzbergen.** *Compt. Rend.* 117 (1893): 72-74. **Rabot.**
Sur les glaciers du Spitzberg. Note de M. Charles Rabot.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

- Atlantic.** *B.S.G. Com. Bordeaux* (1893): 257-272. **Hautreux.**
A. Hautreux. L'Atlantique en 1892 et le climat de la Gironde. *With maps.*
- Mountain-structure.** *Petermanns M.* 39 (1893): 136-141. **Rudzki.**
Eine Betrachtung über die Kontraktions theorie der Gebirgsbildung und die Beschaffenheit des Erdinnern. Von M. P. Rudzki.

GENERAL.

- Biographical Dictionary.** **Lee.**
Dictionary of National Biography. Edited by Sidney Lee. Vol. xxxv. MacCarwell—Maltby. London, Smith, Elder & Co., 1893: size 10 × 7, pp. vi. and 447. *Price* 15s.

The following names more or less connected with geography and travel appear among the notices in the present volume:—John McCluer, by Prof. J. K. Laughton; Sir Robert John le Mesurier McClure, by the same; Robert McCormick, by the same; Sir Richard Graves Macdonnell, by G. C. Boase; Sir Charles Metcalfe Macgregor, by Capt. S. P. Oliver; John Macgregor, by J. M. Rigg; John Macgregor (Rob Roy), by C. A. Harris; Alexander Murdoch Mackay, by A. H. Millar; Sir Alexander Mackenzie, by H. M. Chichester; Charles Frederick Mackenzie, by the Rev. W. Hunt; Colin Mackenzie, by H. M. Chichester; John McKinlay, by C. A. Harris; Angus Macmillan, by the same; William Watts McNair, by W. A. J. Archbold; James Macqueen, by G. Goodwin; and Richard Henry Major, by E. J. L. Scott.

- Languages.** **Vasconcellos.**
Sur le Dialecte Portugais de Macao. Exposé d'une mémoire destinée à la 10^e Session du Congrès international des Orientalistes. Par J. Leite de Vasconcellos. Lisbonne, Société de Géographie, 1892. *Presented by the Geographical Society of Lisbon.*

Some indications concerning the geographical distribution of Portuguese dialects in Europe, America, Africa, and Asia.

- Map Reading.** **Verner.**
Map Reading and the Elements of Field Sketching. By Major Willoughby Verner. London, R. H. Porter, Simpkin, & Co., 1893: size 7½ × 5, pp. 62. *Illustrations.* *Price* 2s. 6d.

- Races.** **Fortescue.**
The Influence of Climate on Race. By the Hon. John W. Fortescue. Size 10 × 6½, pp. 12. *From the 'Nineteenth Century,' May, 1893.*

- Voyages—Columbus, &c.** **Markham.**
The Journal of Christopher Columbus (during his first voyage, 1492-93) and Documents relating to the Voyages of John Cabot and Gaspar Corte Real. Translated, with Notes and an Introduction, by Clements R. Markham, C.B., F.R.S. London, The Hakluyt Society, 1893: size 9 × 6, pp. liv. and 260. *Presented by the Hakluyt Society.*

The eighty-sixth volume of the Hakluyt Society's publications, like the second and the forty-third, is mainly devoted to the writings of Columbus, and now the Society has published translations of everything which survives of the great navigator's writings. In this instance the journal of the first voyage is very ably connected with the immediate results of that voyage—the explorations of Cabot and Corte Real. Mr. Markham has annotated the whole, making clear many points formerly obscure.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

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(*E. Stanford, Agent.*)

Germany.

Königl. Preuss. Landes-Aufnahme.

Karte des Deutschen Reiches. Scale 1:100,000, or 1:3 geographical mile to an inch. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1893. Sheets:—66, Rügenwalde; 79a, Helgoland; 108, Spiekeroog; 109, Wangeroog; 657, Waldshut; 669, Oltingen. Price 1'50 marks each sheet. (*Dulau.*)

Greece.**Curtius and Kaupert.**

Karten von Attika, Auf Veranlassung des Kaiserlich Deutschen Archäologischen Instituts, und mit Unterstützung des Königlich Preussischen Ministeriums der Geistlichen, Unterrichts- und Medicinal-Angelegenheiten, Aufgenommen durch Offiziere und Beamte des K. Preussischen Grossen Generalstabes. Mit erläuterndem Text herausgegeben von E. Curtius und J. A. Kaupert. Heft. vii. Bl. xx. Tatoi; Bl. xxi. Salamis. Massstab 1:25,000, or 2·5 inches to a statute mile. Dietrich Reimer (Inhaber, Hoefer & Vohsen), Berlin, 1893.

Lakes Districts of British Isles.**Johnston.**

Map of the Lake District of England. Scale 1:284,700, or 3·9 geographical miles to an inch. Map of the Lake District of Scotland. Scale 1:380,160, or 6 statute miles to an inch. Map of the Lake District of Ireland. Scale 1:94,900, or 1·5 statute mile to an inch. W. & A. K. Johnston, Edinburgh and London. Price 1s. each. Presented by the Publishers.

These maps fold into a handy size for carrying in the pocket, and so far as that is concerned are suitable for tourists. In other respects, however, they are not so satisfactory as they might be, either as regards clearness of drawing or the amount of information they contain.

AFRICA.**East Africa.****Höhnel.**

Provisorische Original-Karte der Expedition Wm. Astor Chanler's vom Tana-Fluss zum Guasso-Njiro. Aufgenommen u. gezeichnet von L. R. v. Höhnel. K. u. K. Linienschiffsleutnant. Scale 1:500,000, or 7·8 statute miles to an inch. *Petermann's Geographische Mittheilungen*. Jahrgang, 1893. Tafel 9. Presented by the Publisher.

Kilimanjaro.**Hassenstein.**

Spezialkarte des Kilima-Ndscharo- und Meru-Gebietes. Nach Breitenbestimmungen, Routenaufnahmen, Winkelmessungen, &c., von Dr. Hans Meyer, Lieut. L. v. Höhnel, Dr. Oscar Baumann u. A., bearbeitet und gezeichnet von Dr. B. Hassenstein. Scale 1:350,000, or 4·7 geographical miles to an inch. *Petermann's Geographische Mittheilungen*. Jahrgang, 1893. Tafel 7. Gotha, Justus Perthes, 1893. Presented by the Publisher.

AMERICA.**British Columbia.****Brownlee.**

Map of the Province of British Columbia. Compiled by J. H. Brownlee, D.L.S., from the latest maps and surveys and all reliable sources of information to date. By direction of the Honourable F. G. Vernon, Chief Commissioner of Lands and Works. Victoria, 1893. Scale 1:2,070,000, or 32·5 statute miles to an inch. (*Stanford*).

This map shows all the divisions of British Columbia, and contains more detail than any previously published map of that Province. It is produced in a very rough style, the railways being drawn in much the same style as is usually seen on the maps in time-tables; the hill-shading also is anything but satisfactory. A departure has been taken in the position assigned to the boundary between Alaska and British Columbia, in the neighbourhood of Revilla Gigedo Island, by which some of the islands and mainland, which on all previous maps have been shown as part of Alaska, are taken into British Columbia. As this is a point in dispute at the present time, it would have been better to have indicated the boundary as uncertain, instead of marking it with a hard line on insufficient authority, and care should have been the more especially taken in this respect as the map is a Government publication. Considering the amount of survey work that has been done in this Province since 1857, it would not be unreasonable to have expected a much better map both as regards details and the style of production.

California.**Sierra Club, San Francisco.**

Map of a portion of the Sierra Nevada, adjacent to the Yosemite and Hetch Hetchy Valleys. Scale 1:253,310, or 3·47 geographical miles to an inch. J. N. Le Conte, 1893. Map of a portion of the Sierra Nevada adjacent to the King's River. Scale 1:253,310, or 3·47 geographical miles to an inch. J. N. Le Conte, 1893. Compiled for the Sierra Club, San Francisco, California. Presented by the Sierra Club.

These two maps, which embrace the southern portion of the Sierra Nevada, have

been compiled for the Sierra Club, an institution which has been formed for the purpose of exploring and rendering accessible the mountain regions of the Pacific coast, and also to enlist the support and co-operation of the people and the government in preserving the forests of the Sierra Nevada. The maps are outline sketches on which the positions of mountains are shown; but the heights are only given in a few instances. No doubt these may be regarded as preliminary sketch-maps, and that future editions will contain more detailed information.

Mt. St. Elias.**U.S. Coast and Geodetic Survey.**

Skizze der Mt. St. Elias Regione Alaska. Zur Uebersicht der vom U.S. Coast and Geodetic Survey ausgeführten Messungen im Jahre, 1892. Scale 1:1200,000, or 18·7 statute miles to an inch. *Petermann's Geographische Mittheilungen*, 1893, seit 142. Justus Perthes: Gotha. *Presented by the Publisher.*

GENERAL.**German Colonies.****Langhans.**

Deutscher Kolonial-Atlas. 30 Karten mit vielen Hundert Nebenkarten, entworfen, bearbeitet und herausgegeben von Paul Langhans. Vierte Lieferung. Inhalt: Nr. 28, Schutzgebiet der Neu-Guinea-Kompanie, Blatt 5. Nr. 30, Schutzgebiet der Marshall-Inseln. Gotha: Justus Perthes, 1893. *Price 1 mark 60 pf.*

Sheet No. 28 contains the south-eastern extremity of New Guinea and the neighbouring islands with numerous insets. Sheet No. 30 is a map of the Marshall Islands, with enlarged plans of the separate islands as insets.

The World.**Johnston.**

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Parts 20 and 21. W. & A. K. Johnston, Edinburgh and London. *Price 4s. 6d each. Presented by the Publishers.*

Part 20. Sheet 17 is the central sheet of a map of the Dominion of Canada, with insets of Niagara, Montreal, and Quebec. Sheet 22 is a map of Turkey in Europe, with Rumania, Servia, Montenegro, and Bulgaria, with insets of the Bosphorus, and Constantinople, and the Island of Crete. Part 21 contains a map of Spain and Portugal, with insets of the Canary Islands, Madeira, Lisbon, and Madrid; and the eastern sheet of a map of the Dominion of Canada comprising New Brunswick, Nova Scotia, Prince Edward Island, Cape Breton Island, and Newfoundland. This excellent atlas is now approaching completion, and only seven parts remain to be published. The maps, which are very nicely drawn and brought up to date, are each accompanied by an index.

The World.**Vidal-Lablache.**

Atlas Vidal-Lablache, Maitre de Conférences de Géographie à l'École Normale Supérieure, Histoire et Géographie, 137 Cartes, 248 Cartons. Index alphabétique de plus de 40,000 noms. (L'Atlas complet paraîtra en 24 livraisons). 20^e Livraison. Paris, Armand Colin & Cie., Editeurs. *Price 1 fr. 25 c.*

Sheets 108a, 108b, and 108c, together form a map of Great Britain and the neighbouring coasts of France and Belgium, orographically coloured, with a small inset map showing the positions and extent of the British Colonies. Sheet 108d is a map of Ireland drawn on the same scale and coloured in the same manner as the map of Great Britain. Sheet 117 contains maps showing products, industries, and races of Asia. Sheet 119 is a political map of Asia, with insets showing its principal physical features, the area which has been surveyed, and the principal explorations. Sheet 120 is a map of Western Asia. Each of the maps is accompanied by notes.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

The Geographical Journal.

No. 3.

SEPTEMBER, 1893.

VOL. II.

JOURNEYS IN FRENCH INDO-CHINA (TONGKING, ANNAM, COCHIN CHINA, CAMBODIA).

By the Hon. GEORGE N. CURZON, M.P.

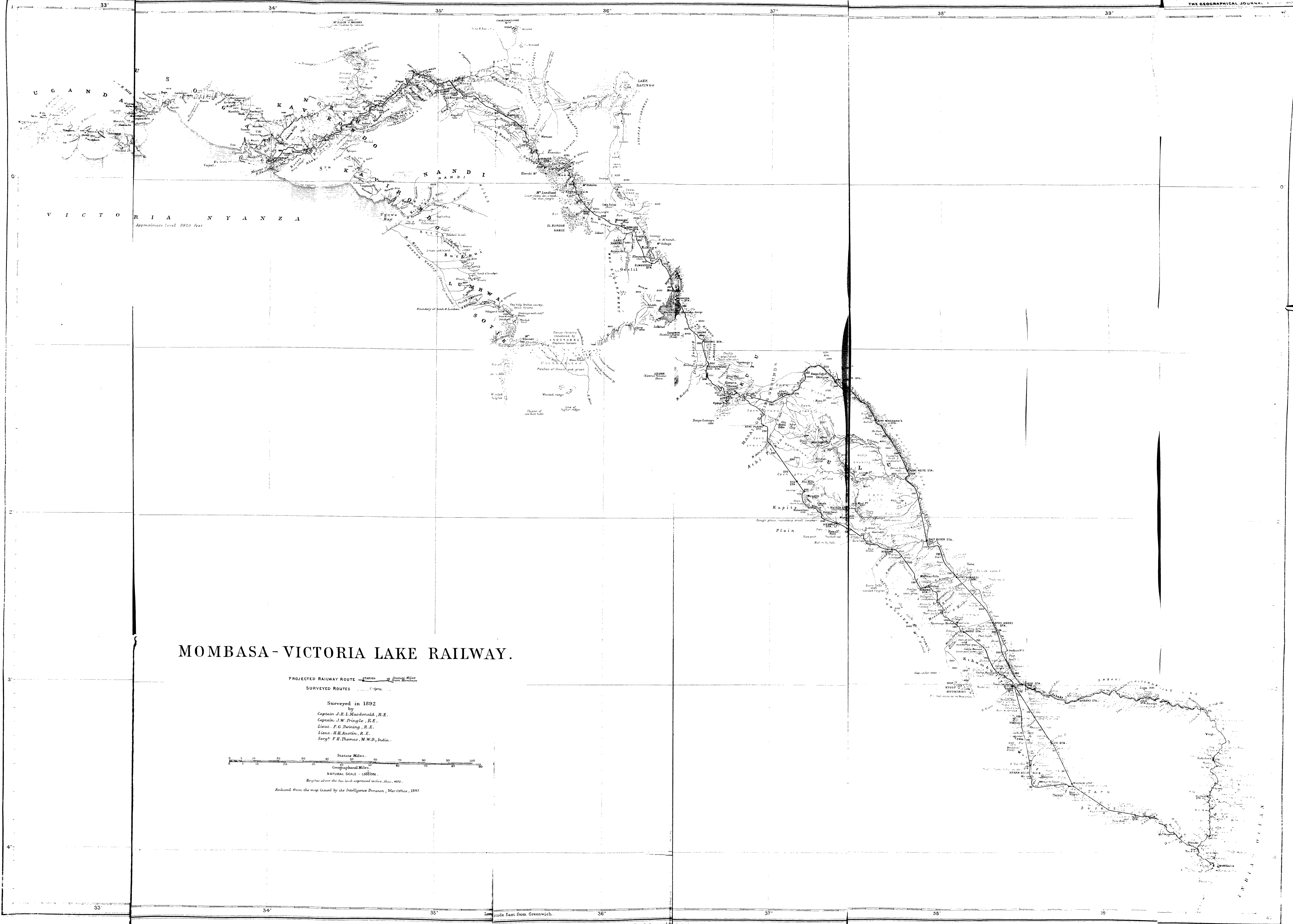
(*Conclusion.**)

(2) PEOPLE, FLORA AND FAUNA.

HAVING now described the main external features of Annamite scenery and life, I pass to the people themselves. The first point to notice is the general uniformity of type throughout the whole Annamite dominions, *i.e.*, in Tongking, Annam Proper, and Cochin China. Writers with a political aim have endeavoured to draw a distinction between these three populations, with the view of suggesting their sub-division into different states. But the difference is no greater than might be expected from the diversity of latitude and climate; and the inhabitants of Hanoi, Hue and Saigon (where not crossed with foreign blood) are essentially the same race, possessing the same ethnological characteristics and the same social organisation. In the north they are better-looking and more robust; the ugliness seems to culminate between Thanh-hoa and Hue; at Saigon the type is more effeminate, the effect of the unbroken heat.

I have seen it stated that the Annamites are the most hideous of the Eastern races. This verdict, which was passed by a gold medallist of this Society, who had never been in Annam, is one with which I entirely disagree. The people are obviously of the Yellow or Chinese stock. The square jaw, sallow skin, prominent cheek bones, thick lips and oblique eyes, testify unmistakably to their origin, and completely discredit the theories, which have found exponents, of Malay or even of Japanese affinity. Compared with the Chinese, Cambodians, and

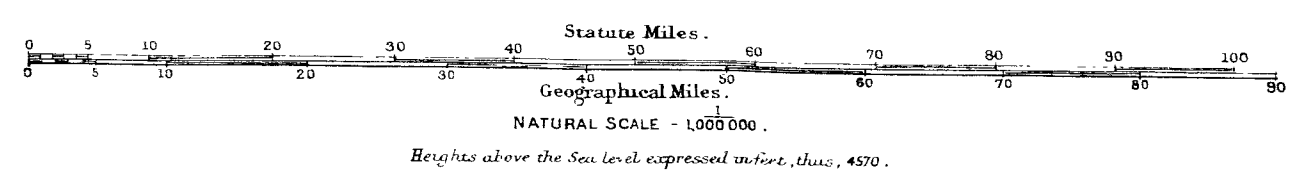
* The first part of this paper was published in the August number, pp. 97-111. Map. p. 288.



MOMBASA-VICTORIA LAKE RAILWAY.

PROJECTED RAILWAY ROUTE — STATION — 10 Survey Miles from Mombasa
SURVEYED ROUTES — — — — —

Surveyed in 1892
by
Captain J.R.L. Macdonald, R.E.
Captain J.W. Fringle, R.E.
Lieut. P.G. Twining, R.E.
Lieut. H.H. Austin, R.E.
Sergeant F.H. Thomas, M.W.D., India.



Reduced from the map issued by the Intelligence Division, War Office, 1895

Siamese, who are their next-door neighbours, the Annamites are very short of stature; but they are lithe, well-made, and have small hands and feet. A thin beard and moustache only spring into existence after the age of thirty, and are sedulously cultivated by the elders and Mandarins. There is some difficulty in ascertaining an Annamite's age, because he counts any fraction of a year as a whole year. Thus, a child born on December 31st, 1892, will be two years old by nightfall of January 1st, 1893. In infancy too, no family names are borne. A fancy name is perhaps given in order to forefend the evil spirits by hoodwinking them as to the identity of the infant; or the latter is simply called by his numerical position in the family, as *e.g.*, Père VI., the Annamite priest and Mandarin before mentioned, who was the sixth child of his parents.

Both sexes have very black hair, which after childhood is never cut, but is coiled into a chignon at the back of the head. The bulk of the women whom one sees in travelling through any Oriental country (with the possible exception of Japan) are ugly, some would even say monstrous; nor can I claim an absolute immunity for the average Annamite woman from this melancholy law. Nevertheless, there is a softness and gentleness about her expression that redeems irregularity of feature; whilst a considerable minority of the young girls are positively pretty, and, if containing an admixture of foreign blood, whether Chinese or European, sometimes highly attractive. In travelling I have nowhere encountered a more gentle or amiable race. They have the submissiveness without the nerveless apathy of the Hindu; while they possess industrial aptitudes rendering them diligent workmen, and an artistic ingenuity—I do not say originality—which on the one hand makes them excellent cooks, on the other inspires the various artistic productions, such as inlaid work in mother-of-pearl, embroideries, wood-carving and jewellery, which are still sometimes procurable and are seldom absent from the houses of the wealthy Mandarins. Though not a courageous people in the sense of inviting or voluntarily meeting danger, they are very tenacious in resistance, and make capital soldiers against an Asiatic enemy. They are moreover hospitable, polite, lively, sentimental, and of easy temper. The women present two types, the wife or concubine who is merely the brainless instrument of her master's pleasure, and the active and business-like housewife, who toils hard either in the fields or at the oar, and who in the upper ranks of life frequently takes to business and manages all her husband's affairs. On the other hand, the Annamites have the faults inseparable from an Oriental race that has never been divorced from its own surroundings. They are tricky and deceitful, disposed to thief when they get the chance, mendacious, and incurable gamblers. They will never lose an opportunity of throwing a die or casting a lot, and the financial embarrassments of the upper class

are responsible for the transfer of so many elegant and antique objects to the cabinets of French collectors.

Polygamy is the custom of the country, there being no limit, beyond expense, to the number either of wives or of concubines that a man may take, although the first wife, not necessarily in chronological order, but in status, holds a position of recognised superiority. In a country where ancestral worship is the pivot of life, the necessity of male offspring is overpowering, and a sterile wife would be the first to suggest and even to furnish a substitute to her husband. Families are very large, the women being of remarkable fertility. Hardly a cottage but contains a swarm of black-eyed, half-naked urchins, a full quiver being a source not of encumbrance but of riches to the happy father, since at a very early age the child can be employed to tend the buffaloes or to pull an oar in the sampan. Though nubile at the age of twelve, the girls are not usually wedded quite so early, and child-marriages like those of India are rare.

In dress there is very little except the hat (which is frequently discarded) to mark the distinction between the two sexes, for both wear the same costume, effectively concealing the lines of the figure. It consists of a long loose tunic (*cai ao*), made of cotton, or in the upper classes, of silk, which comes close up round the throat, is fastened by little brass or amber buttons down the right side, has very narrow sleeves, and falls to the knees or even lower. In Tongking the predominant colour of this tunic among the peasants is chocolate brown, in Annam blue, and in Saigon black. Under this the women wear a chemisette over the bosom, while the rich of both classes wear several light tunics one over the other. Below the tunic the universal garb is a pair of broad flapping cotton drawers (*cai kwan*), white for men, black for women. Both sexes have their legs and feet bare except among the upper classes, who wear socks and Chinese shoes. The far East excels in astonishing hats, and Annam claims its share of the general credit. The commonest male headgear is the turban (*cai khan*) formed of a roll of cotton or *crépon*, dark green, blue, or brown, which is twisted round the head below the chignon, the ends standing out like horns on either side. But there is also a big conical straw hat for men (varnished over outside and terminating in a metallic cone) which is held on by a string underneath the chin; and at Saigon another variety of coarse fabric with a broader brim, a curving outline, and a lower apex. But the palm for originality (in more senses than one) is carried off by the headpiece of the woman, which is a marvellous circular structure, some 2 to 2½ feet in diameter, made of the leaf of the *cai co*, a plant of the palm tribe, and sometimes most exquisitely fabricated. It has a brim 4 inches deep, which instead of standing up is turned downwards; so that when the whole hat is inverted, it makes a most admirable and artistic tea-tray for a European boudoir. Inside the rim of the hat are fixed one or two

long black silk tassels, which hang down on either side of the wearer's face. With such a headpiece there is small chance of a sunstroke; for the shadow which it throws is more than sufficient to cover the slender periphery of the Annamite woman.

The men smoke minute cigarettes and the waterpipe. But the habitual and universal solace of both sexes is the areca nut and betel (the preparation consists of a piece of areca nut folded in a slice of betel leaf and flavoured with a dash of lime), which is rarely absent from the mouth of man or woman. Its disgusting external effects are well-known, for it blackens and corrodes the teeth, discolours the lips and gums, and fills the mouth with a scarlet saliva that calls for constant ejection. To anticipate or to render more harmonious the effects of this practice, the women invariably lacquer their teeth in advance with a black preparation similar to that which used to be affected by the Japanese, and which makes an open mouth like a yawning sepulchre. Should they scrape off this coating, they lose caste. The men sometimes lacquer their teeth, but are usually satisfied with nature's discolouration. It is to the same practice that I suppose must be attributed the total absence in Annam of that agreeable mark of salutation which has been sanctified by the practice of so many ages, viz., the kiss. Lips so tainted could hardly embrace. Accordingly the only kiss of which the Annamite woman is cognisant is to place her nose against the man's cheek and to rub it gently up and down, with a kind of canine sniff. Both classes have a peculiar gait, with the legs kept rather wide apart and the arms swinging; but it seems to be peculiarly affected by women and Mandarins. Children are carried astride upon the hips of their mothers—an attitude which is apt to produce bandy legs in later life. Burdens are borne at the ends of bamboo poles. When it rains all classes, from the official to the peasant, put on a cloak made of layers of palm-leaves sewn together and absolutely impervious even to a downpour. But they have nothing corresponding to the oiled waterproof paper of Korea, which is uniformly lighter and more serviceable, and can be used as a covering for baggage.

Rice is the staple food of the peasantry, being pounded by the women in mortars of stone or wood. The Annamites dispense with chopsticks and eat with their fingers; an immense amount of fish is also consumed, and its capture is the second great national industry. In many of the rivers, and also on the coast, traps are set by an intricate arrangement of light bamboo stakes and palisades. In Cochin China huge circular nets are let down from a projecting hole at the end of the sampan, and are seldom pulled up without some spoil. In the *bacs* of Annam I saw men prodding the bottom for shell-fish; in the Siem Reap River in Cambodia they were thrusting with spears under the trees. The Talé Sap or Great Lake and the Lower Mekong swarm with every variety of fish. At points along the Annamite coast oysters and lobsters are found;

prawns are universal, and at a fishing-village named Balong, near Thanh-hoa, it was said that regularly every year a shoal of whales is expected in the month of March. The popular drink is weak tea, while the only intoxicant consumed on at all a large scale is arrack or brandy distilled from rice.

The vegetation of Indo-China is almost uniform from China to Siam. In the deltas and along the rivers there is a luxuriant growth of bamboos, bananas, and palm trees, chiefly the areca and coco-nut, but also lower and more stunted types. Among other fruit-trees are the jack fruit, mango, mulberry, tamarind, litchi, orange, lemon, pine-apple and bread fruit. Vegetables are represented chiefly by beans, onions, radishes, and sweet potatoes. Tobacco is grown for local consumption; cunao and indigo yield their respective dyes; cinnamon is exported in great quantity by the Chinese from Annam, Faifu, south of Turan, being the principal mart for this valuable product. A vegetable oil is extracted from several trees.

Game is abundant in Annam, and embraces many varieties from the most important large game, such as elephants and tigers, to the smallest water-fowl, such as snipe. The elephant is found in the provinces south of Hue. All those captured or killed by the natives belong of right to the Emperor, and a corps of royal hunters is maintained as in Korea, who pursue their illustrious quarry with huge matchlocks, and a bullet not much smaller than an orange. It may be judged that their annual bag is not very large. The tiger is exceedingly common in the mountains of Annam, and is regarded by the natives with so wholesome an awe that he is frequently worshipped as a god. Driven down to the plains in search of food, he sometimes attacks the *tram-coolies* and postal couriers when discharging their errands, and they have a particular and excusable aversion to going alone at night. The extermination of the beast is encouraged by a reward of 20 dollars, which is paid upon production of the pads, skin, and tail. It is a curious fact that the same spots are commonly frequented by the tiger and the wild peacock. Whether they have a similar eye for the beauties of nature, or whether the tiger enjoys lying down outside the peacock, I do not profess to determine. In the mountains may also be encountered wild oxen, wild buffalo, moufflon, and three varieties of deer, of which two resemble our red and fallow. Monkeys abound in parts, and on the peninsula of Tiencha, off Turan, there is a peculiar variety with grey skin, white face, legs and tail, a red beard and black paws. They are difficult to capture living, and not easy to bag dead, for as soon as one has been wounded or shot its comrades will pick up its body and carry it off. In the jungles the wild cock (the ancestor of the farmyard chanticler) is found, also several species of pheasant, including a species of argus, and the English hare. Wild ducks and snipe abound, also herons and egrets, whose white plumes are exported to gratify the humour of ladies and the vanity of

colonels. From some islands off the coast near Turan also comes the peculiar delicacy so much appreciated by the Chinese palate of swallows' nests. The article consumed in the form of soup is a gelatinous secretion deposited by the saliva of the bird on the interior of the nest, and when properly flavoured is far from disagreeable to the taste. The commonest domestic animals are buffaloes, which are used everywhere for ploughing the rice-fields, and of which there are said to be over one million in Indo-China, and a species of pretty, meek-eyed, brown-skinned oxen; pigs and fowls are universal.

The French anticipate a great future for the coal-fields of Annam, though their roseate expectations fall unexpectedly short of the point of providing the capital requisite to work them. This accordingly is supplied by Hongkong financiers; and if ever it arises that Cardiff and Nagasaki are ousted from their command of the China Seas by Tongking and Annam, and that French men-of-war coal in French Asiatic harbours to molest British commerce, it will be to British investment that the result will be due. I visited myself the coal-mines of Hatu, near Hongai, on the Bay of Along, which have so far produced the best results; as also the more recently opened galleries of the mines of Nongson in the mountains, at a day's journey by river south-west of Turan. Opinions have hitherto differed somewhat as to the value of this coal as fuel for steamers, some ships' captains having reported most favourably, while others have rejected it after trial. It would appear that the best quality burns well, being a fine bituminous coal; but that the coarser samples require a greater draught than most grates admit of, and also crumble easily to coal-dust. To utilise this residuum a briquette factory is about to be established at Hongai. One phenomenon these mines present, which I imagine must be unique in the world. At Hatu I saw a solid seam of black coal 180 feet in depth, exposed down the entire front of a hill; nor had the bottom of the seam yet been ascertained. Coal also exists, and is worked, at Nagotna, near Hongai, at Kamfa and Kebao on the same south littoral of Tongking, and has been discovered in large quantities in the interior at Yenbai, Laokai, and Kwangyen.

As regards the best season for travelling in Indo-China, the geographical conditions of the three territories result in very marked differences of climate; for whereas in the two deltas of the Red River and Mekong, the seasons, regulated by the north-east and the south-west monsoon, are rainy from the month of May to August, and intolerable because of the intense heat, while the months from October to April contain the more agreeable weather—in Annam, where the Annamite Apennines, running parallel with the coast along its entire length, arrest the winds and condense the vapours raised by evaporation from the sea, the dry season is between January and September, and the wet season from September to December. The best season for visiting



MAIN APPROACH TO ANGEOR WAT.

Tongking and Cochin China is therefore between the months of November and January. Annam, on the other hand, is best in March. Europeans find life very hard in each of these territories in the hot season; and dysentery and fever are with difficulty avoided.

(3) TURAN TO HUE.

Before leaving the subject of Annam, I propose also to describe the route from Turan on the sea coast to Hue, since it is the road that nineteen persons out of twenty, bent on visiting the capital, will follow, and since no itinerary of it, so far as I know, exists in the English language. Steamers of the subsidised Messageries Maritimes Company touch fortnightly at the ports of Turan, Kwinhon, and Nia-trang, on their way from Haifong to Saigon, and *vice-versâ*. A line of German merchant steamers also runs at irregular intervals from Hongkong direct to Turan. Access to Hue is more directly gained from Thuanan, a small French post at the mouth of the Hue River, distant by water about 9 miles from the capital; but the steamers do not stop there—very wisely, since, during at least a third of the year, while the north-east monsoon is blowing, the bar is impracticable for any kind of boat. Whilst I was in the neighbourhood not a single craft had crossed it for five or six weeks; and the breakers were a gruesome spectacle. The distance between Turan and Hue is 100 kilometres, or 63 miles, and it is usually accomplished, in a chair carried by coolies, in two short days. I made the journey twice, once in each direction; but the conditions on one occasion were so unfavourable, the entire country being inundated, and every species of misadventure befalling me, that I took a much longer time. The intervening stages and distances are as follows:—

	Kilometres.					
Turan*						
Nam*	13
Lien Kiu	6
Col des Nuages*	9
Leng-ko*	7
Pass of Fu Gia	7
Nuok Ngok* (<i>tram</i> -Thua-lien)	4
Pass of Cholmai (Thua-mai)	9
Cohai* (Thua-lea)	5
Thuanong*	20
Hue*	20
Total	100

From the little settlement of Turan, lying at the south side of the bay of the same name, the imposing mass of a transverse ridge, projecting from the main inland range, can be seen dominating the bay on its

* *Tram*.

northern side and terminating in a wooded cape in the sea. This range, which separates the provinces of Kwang Nam and Kwang Duk, has been the immemorial defence of the capital; since it requires to be crossed by any enemy advancing from the south. Its highest peaks are between 2000 and 3000 feet above the sea; but the saddle by which it is crossed, and which the French call the Col des Nuages, is 1550 feet in elevation.

Leaving Turan, the route for some time skirts the sea-shore, then crosses a *bac*, spreading out into a river, up which fishing-boats sail across a bar from the sea, and arrives (two and three quarter hours) at the first *tram* of Namô, where coolies are changed. This is a pretty little village, with a single street, situated near a wooded knoll on the banks of a river whose waters spread themselves out into one of those lagoons which I have described in the opening section of this paper, one of its two marine outlets beings already choked. Two branches of this river require to be crossed in ferry-boats, and we then arrive at Lien Kiu (one hour). Shortly after commences the ascent of the main ridge by the new road, which has been constructed by the French since their occupation of the capital. Passing the hamlet of Nam Chon, where Captain Besson and six men were murdered by Annamite coolies while building the road as lately as 1888, we mount by easy gradients, till after climbing a final steep slope, we arrive at the Col des Nuages (two hours). Here is a *tram* and the second change of coolies. The saddle between the two peaks was formerly entirely built across, and occupied by a walled enclosure with two gates, one of entrance, the other of exit. This was defended by cannon and by a garrison of fifty soldiers, and effectually commanded the pass. Now the wall is broken down, and the road skirts the fort without entering it. In the interior I found a number of rusty iron carronades under a shed, and a fine bronze cannon, with an inscription showing that it was presented by Spain to the King of Cochin China in 1689. On a clear day the two-fold view from the Col des Nuages (sometimes also called the Iron Gates, and by the Annamites Haiven Kwang) is one of the most beautiful in the far East. The retrospect to Turan embraces the curving outline of the bay far below, the wooded peninsula of Tiencha by which it is closed on the south, the white line of Turan, the Marble Mountains protruding their contorted heads from the sand dunes beyond, and inland a panorama of mountains enclosing the plain. On the north side the eye wanders over the superbly wooded slopes of the ridge, where mountain streams are heard rushing through the foliage, and waterfalls throw a fleecy scarf against the sombre background, and rests upon the glassy surface of a distant lagoon, separated from the sea by a glittering sandspit, upon which the breakers are plunging in yellow foam.

Descending we pass in a few minutes the little hamlet of Dien, then

(fifty minutes) the hamlet of Bon Nhi on the banks of a stream; later (forty minutes) a gate-tower with an inscription in three tablets, formerly occupied by a road-guard to command the approach to the main pass. We are now on the lower slopes of the ridge, from which we presently descend by a very steep declivity to the maritime exit of the big lagoon (two and a half hours after leaving the *col*). Here we have to cross the channel by a ferry, and may once again observe the phenomenon of a lagoon whose sea-mouth is in rapid process of being silted up by the action of the winds and tides.

Upon the far side of the *bac* is situated the picturesque village of Leng-ko, with a cluster of coco-nut palms, an avenue of oil trees, numerous pigs, and a population that subsists upon fishing. At the *tram* here called Thua Fuok, we take on the third relay. Thence the road continues along the narrow sandspit that separates the still waters of the lagoon from the booming sea. There is a smell of rotting vegetation in the air, and the physical features—the lagoon, the sandspit, and the breakers—suggest an irresistible reminder of the *murdabs* or “dead waters” in the Persian provinces on the south shore of the Caspian Sea. In summer the sand is sometimes so hot that the coolies cannot tread upon it with bare feet. In the low scrub, with which it is overgrown, may be seen circular mounds of glittering white sand, the last resting-places of former inhabitants of Leng-ko. A march of one hour and a half brings us to the extremity of the lagoon, where is the tiny village of Kenang. Climbing a steep saddle by steps partly fashioned, partly hewn in the natural rock, from the top we discover a new outlook over a plain, across which the track is seen running to the base of a single wooded hill. In an hour we reach the village of Nuok Ngok, lying in the middle of a soaking plain, where brown buffaloes are wallowing in the marshes, green turtle-doves flit from tree to tree, and white egrets fish lazily in the swamps. Continuing we arrive (one hour forty minutes) at the base of a third pass or *col* known as Fong Luong or Cholmai (lit. Thua-mai), climbing and descending which we pass (fifteen minutes) the village of Kwang Rap, and (thirty minutes) reach the larger village of Kohai (lit. Thua-hoa), where also is a *tram*.

From this spot there are three ways of proceeding to Hue, or *vice versa*. (1) Continuing by land along the Mandarins' Road, a distance of 25 miles, which is bisected by the *tram* of Thua-nong; (2) by a steam launch up the lagoon of Kohai to Thuanan, and thence to the capital; and (3) a route sometimes adopted on the return journey from Hue, whence a *sampan* can be taken at nightfall by the traveller, who sleeps while the boat is propelled along a canal leading into the Fu-kam River, which debouches into the lagoon of Kohai, where he arrives in the early morning. I unfortunately adopted the second of these routes on the upward journey, with disastrous results. The whole country was under water owing to torrential and incessant rains, and there were no

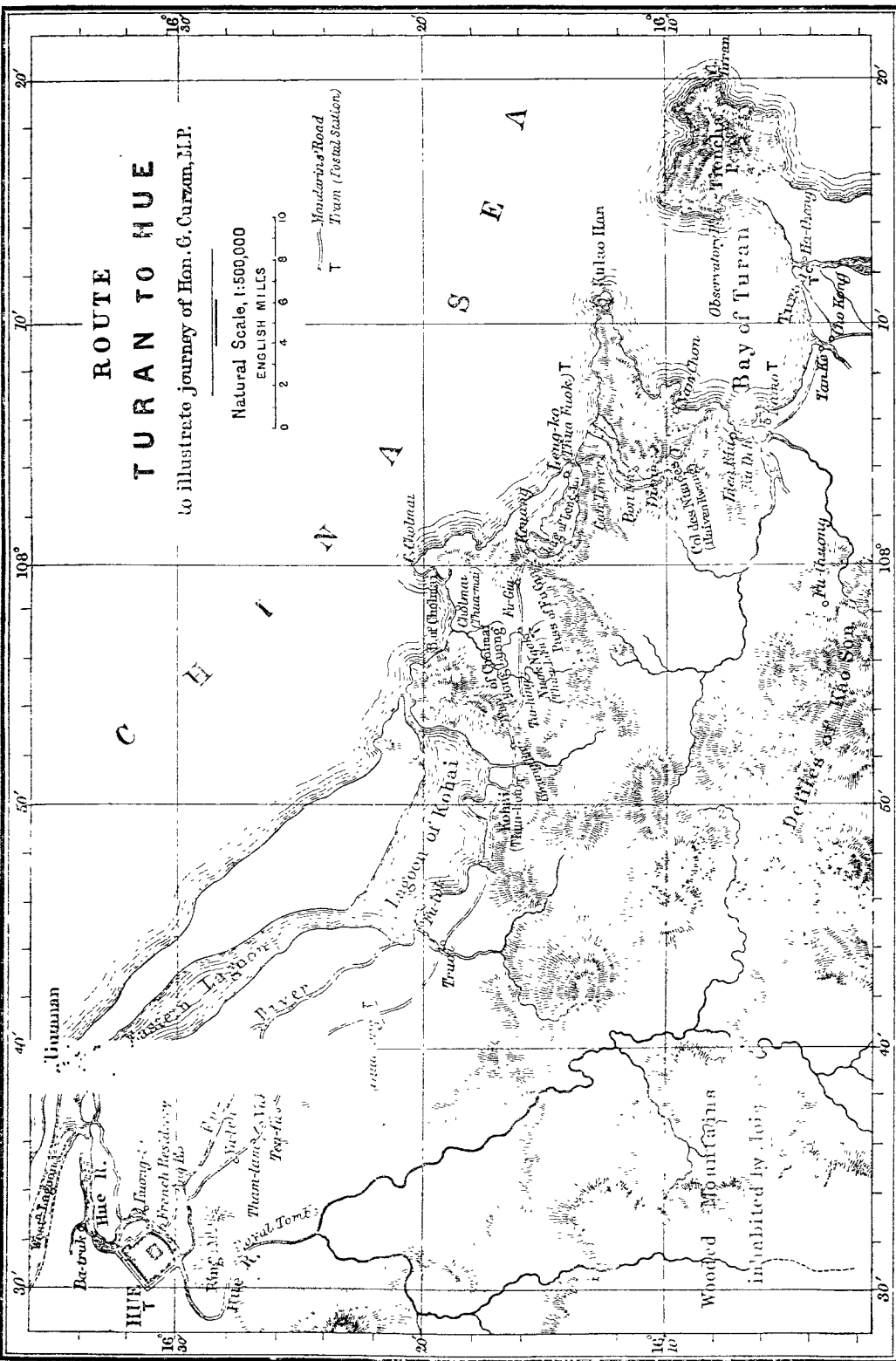
ROUTE TURAN TO HUE

to illustrate journey of Hon. G. Curzan, ELL.

Natural Scale, 1:500,000
ENGLISH MILES



— Mountain's Road
T Tram (Postal Station)



means of distinguishing the lagoon from inundated rice-fields. Accordingly the steam launch ran aground, lost its way, ran short of fuel, and committed every possible transgression, compelling me to pass one night in a miserable fishing-boat, and the next in a native hamlet on the shore of the lagoon. The latter runs northwards, parallel with the sea coast, from which it is separated only by a line of sand dunes, and leads into the mouth of the Hue River at Thuanan. At the latter place are a small French garrison, signal-station, and custom house. On the broad surface of the combined river and lagoon are dotted several islets, formerly occupied by Annamite forts, which little more than ten years ago disputed the passage of the river with the French. A line of sunken junks also blocked and still obstruct the channel. Two hours steaming up the Hue River, whose banks are adorned by delicious and smiling verdure, at last deposits us, after a journey, however *accidenté*, of surpassing natural beauty, at the capital of Annam.

(4). HUE.

Originally chosen as a Royal residence in the middle of the 16th century by one of the Nguyen family, who established a sort of Shogunate in the southern part of the dominions of a *fainéant* Emperor of Annam, Hue only received its present form at the beginning of the present century, when, after a period of rebellion, it fell into the hands of the last surviving descendant of that dynasty, the monarch who assumed the ruling title of Gia Long, and was the Louis XIV. of his country's fortunes. He built the Citadel, an immense enceinte on the Vauban plan, with the aid of the French officers who had entered his service and had assisted to place him upon the throne. He laid out and adorned the Palace; and any work of distinction in the capital or neighbourhood is attributed to him with as unfailing regularity as to Shah Abbas in the kingdom of Iran. The Hue River, flowing down from picturesque mountains that raise their wooded cones at a distance of only a few miles from the walls, leaves the city and citadel (which is further surrounded by a broad moat) on the south side, and separates by over $\frac{1}{2}$ mile of water the native quarter from the French Residency. The town itself consists, as I have said of all Annamite cities, of two parts; the Citadel, which is the seat of government, royal or provincial, and a cluster of native villages assembled within its shade. Before Hue was known the fancy of writers raised the numbers of this aggregation to a total of 150,000 inhabitants. Even now French books record 50,000, but I should be disposed to place 12 to 15,000 as an outside limit, although the extraordinary size of Annamite families may perhaps justify a higher estimate. The citadel consists of a bastioned quadrilateral 2000 yards in length on each face, entered by ten gates with lofty, two-storeyed towers, over stone bridges across a moat 40 yards

wide. Four hundred guns originally defended the embrasures, but are now for the most part consigned to a prudent seclusion. In the heart of this great and utterly indefensible enclosure, over which houses are scattered at irregular intervals, and much of which consists of unoccupied gardens or grounds, is a second walled enceinte, 800 yards square, containing the Royal Palace. This is exclusively peopled by women and eunuchs, with the exception of the sovereign; the royal guards, ministers, and Mandarins, having their residences outside. A fortified redoubt called the Mong-Ka on the eastern face of the citadel was ceded to the French in absolute possession in 1884, and contains the French garrison composed of the Marine Infantry, only 200 strong. A canal, the Dong-ba, crossed by two wooden bridges, separates these official and military quarters from the native town. Occupying a flat position the city presents no salient features upon approach, little being visible beyond the walls of the Citadel, and a pentagonal structure or tower inside it, which supports the Royal standard.

Nothing more pretty than the environs of Hue can well be conceived. On the banks of the river elegant and fanciful pagodas peep from behind a screen of palms and bamboos. Native villages are buried in depths of waving green. The lowlands, where not partitioned in rice-plots, are overgrown by a wealth of flowering and prickly plants. The mountains are wooded to their summits with pines and banyans—a junction of Scotland and the Tropics. At a little distance up the river is an arena, or circular structure—now disused—where combats of wild animals were held as late as the days of Tu Duk. But the most remarkable of the environs of Hue are unquestionably the Tombs of the sovereigns of the reigning dynasty, from Gia Long to the last Emperor Dong Khanh, which are situated at a distance of some miles from the capital in wooded valleys on either bank of the river. The scheme of the finest of these structures, upon which tens of thousands of labourers were employed for years, consists of gardens, lakes, and summer-houses, whither the Emperor could retire for recreation in the summer, and where a memorial hall or sanctuary received the furniture of his apartments, the altar containing his tablet, and his principal surviving wives, after his death: and of a vast enclosure, usually elevated upon successive terraces, rising from the banks of serpentine ponds, and culminating either in a timbered mound or in a walled enclosure, wherein some hidden nook, disclosed to none but a select few, conceals the royal corpse. Every year the reigning monarch must visit each of these tombs, offer sacrifice, and perform his *lais*, or obeisance, before the spirits of his ancestors. It would appear from the character of the landscape-gardening, with which these tombs have been adorned, so un-Oriental in type, that the earlier sovereigns of the dynasty must have received from the French officers in their employ the plans of French gardens of the seventeenth and eighteenth centuries—of Fontainebleau and Versailles. With the accession of Tu Duk a

more strictly native style was pursued; and the tombs of that monarch and Dong Khanh have in them nothing of the French. Amid these gracious and ornamental surroundings of pinewood and winding lake, the sepulchres of Annamite sovereignty are worthy of comparison with any royal tombs in the world.

Of the native government in Annam this is not the place to speak; but I may say that it possesses five main characteristics: (1) The throne is invested with a sanctity peculiar to China and its once dependent states, whose sovereigns are one and all regarded as the sons of Heaven; (2) it has won and retains this prestige independently of the ordinary supports to a powerful throne—viz., a hereditary aristocracy and a priesthood, neither of which exists in Annam; (3) the official ranks are recruited by an educational test which is genuine, though straitened, and is therefore democratic in its operation; (4) Annam exhibits the spectacle, unique in the East, of a complete decentralisation of administrative and executive authority, due to the institution of a communal system, which is enshrined in the customs of the people, and has long familiarised them with the liberties of self-government to which Europe is now returning; (5) the durability of the native *régime*, which is unsustained by military force, and incapable of withstanding a serious attack from without, will depend less upon the Annamite Court than upon the humour of the French, who are now tardily, but wisely, adopting the policy of ruling through the natives, and who, if well-advised, will endeavour to convert Annam into a sort of Indian feudatory state.

IV.—TRAVEL IN CAMBODIA.

(1) SAIGON TO PNOMPENH AND ANGKOR WAT.

Travel in Cambodia will, in the case of most voyagers, take the form of a visit to the capital Pnompenh, and to the famous Khmer ruins of Angkor. Since the latter are deserving of a far more widespread attention than they have yet received at English hands, and since they are likely to be increasingly visited by Englishmen in the future, it may be useful to append some reliable information as to the means of reaching Angkor. Geographically these are two. The ruins are situated at a distance of about 12 miles inland from the north-west extremity of the Talé Sap or Inland Sea, whose waters and coasts are divided between Cambodia and Siam. The entire lake, which is a comparatively late creation, synchronous with the formation of the present Mekong delta, and fills the site once occupied by the sea-margin, appertained to Cambodia, until the wars at the end of the last century transferred the provinces of Angkor, or Siem Reap, and of Battambang on its north and south shores to Siam. The latter has remained in possession of them ever since, and has been confirmed in her ownership

by a treaty concluded in 1867 with the French, after the latter had assumed the protectorate of Cambodia. Though Cambodian in historic association and surroundings, the ruins of Angkor are therefore now in Siamese territory—a source of great annoyance to the French, and of some mortification to the Cambodians. It will be accordingly either from French or from Siamese territory, *i.e.*, from Saigon, or from Bangkok, that the traveller will start as a base, making the journey in the one case, with considerable ease, at certain periods of the year, by water; in the other case, with greater difficulty, but at nearly any season of the year, by land. I will briefly indicate both routes.

Excellent river steamers connect Saigon with Pnompenh, the modern capital of Cambodia, and the residence both of the King, and of the French Resident Superior—performing the ascent in two nights and one day, and the descent in a less time. The city is situated at a point on the Mekong, called by the French *Quatre Bras*, because the river is there divided in the form of a X, two streams which flow from the north-east and to the north-west respectively, uniting opposite the town and being again split up into two channels, flowing south-west and south-east. From Pnompenh, in the months from August to the middle of January, a subsidiary service runs once a week to the *Talé Sap*, touching on the following day at the mouth of the Siem Reap River on the north shore of the lake for Siem Reap and Angkor, and at a similar spot for Battambang on the south shore. After the middle of January the waters of the Mekong, and the lake which it feeds, sink too low to admit of steam navigation, and a traveller making the ascent from Cochin China would then have a long and tedious ascent of the river and lake in a native sampan. The French company (*Compagnie des Messageries Fluviales*) advertise an arrangement by which they undertake with their steamers to convey the traveller to the mouth of the Siem Reap River, conduct him thence to Angkor, show him the ruins, arrange for his accommodation and subsistence while there for a period of three days, and bring him back to Saigon twelve days after his original departure—all this for 50 dollars a head. I do not advise anyone to take advantage of this scheme, because instead of three days at Angkor he will find that he has less than one—and a man might as well try to see the ruins in one day as to see London in an hour—whilst he will spend two days of his twelve in waiting for a connection at Pnompenh. Let the stranger profit by the steamers for ascent and descent; but let him make independent arrangements for as long a stay at the ruins as he can devote thereto, and on no account endeavour to “rush” the expedition.

The north shore of the great lake of *Talé Sap* (called by the French, for what reason I do not know, *Tonlé Sap*), is one of the most peculiar in the world. Its only coast-line is the stems of trees, the greater part of whose height is immersed below the surface of the water, and is only entirely laid bare during the dry season. Through the upper branches

of these the river of Siem Reap lazily struggles to the lake. Embarking in a native sampan, the traveller proceeds for two hours and a quarter up the river, being alternately poled, pulled, or dragged through the shallow channel. It was the beginning of January when I made the ascent, and the water was already sinking rapidly. At a point whence it was impossible to continue further by the river, horses and oxen had been sent to meet me by the Siamese Governor of Siem Reap, who had been apprised of my arrival from Bangkok. A ride of one hour and a half, first through a jungly swamp and subsequently amid delicious scenery along the right bank of the Siem Reap River, which is here of larger dimensions, brought me to the town of that name, and capital of the province, administered by a governor subordinate to the Royal Commissioner at Battambang. The town consists of a few thousand people, and is a picturesque collection of successive hamlets of palm-leaf cottages built upon lofty piles in a shady grove, straggling for some miles along either bank of the river. There is an old-fashioned citadel with battlemented walls, bastions, and gate-towers, which contains the official buildings; but the governor prefers to reside in a private residence on the opposite bank. A *sala*, the Siamese expression for a rest-house, and substitute for the Annamite *tram*, is here placed at the disposal of strangers, but will not as a rule be occupied by anyone anxious to push on to Angkor. A further ride of about $3\frac{1}{2}$ miles along an excellent path through beautiful jungle scenery, will bring him to the outer terrace of the great temple of Angkor Wat. I should add that all the ponies here seem to be the property of the Governor, and can only with difficulty be procured by strangers, who must ordinarily put up with rude springless carts drawn by oxen.

I can here embark upon no general description of the ruins of Angkor, a study which would befit an archaeological better than a geographical society. I will content myself with remarking, after a very careful study of all the remains, which cover an area of some 20 miles square: (1) as regards their purpose, that they were neither dedicated to snake worship, as imagined by Fergusson in his 'History of Architecture'; nor to Buddhism as supposed by Garnier, de Lagrée, and Mouhot; nor to a mixture of the two, as inferred by Vivien St. Martin; but to Brahmanism, pure and simple, upon which, at a later date, were grafted Buddhistic additions, the statues of Buddha in many cases, after the introduction and triumph of that faith, replacing the images of the Hindu deities in the niches and shrines; (2) as regards their origin, that they were constructed by a race known as the Khmers, who came, in all probability overland, from India, conquered the country, and acquired its throne, but whose traces, except in so far as they are merged in the modern Cambodians, have entirely disappeared; (3) as regards their date—a matter in which we have received invaluable assistance from the inscriptions that have been deciphered by French scholars—that they

were erected at different periods between 700 and 1100 A.D.; (4) as regards their material, that all the older buildings are constructed of two varieties of stone—a hard, fine-grained sandstone, invariably employed for the sculptures, and a coarse porous red stone for the substructures; but that the later buildings are made of well-burned and durable bricks; (5) as regards their architectural features, merits, and style, that they constitute on the whole the most remarkable body of ruins in the world, whether we regard the prodigious magnitude of the ground plan, the grandiose dimensions of the principal palaces and temples, or the artistic beauty and delicacy of the bas-reliefs and sculptures; (6) as regards their present condition, that, with the exception of the great temple of Angkor Wat, which is in its essential features comparatively well preserved, the buildings are fast tumbling to pieces, being buried in a deep jungle through which a path has often to be cut with a bill-hook in order to reach them, and whose trees and creepers, insinuating themselves between the stones, are rapidly causing them to fall into irretrievable ruin.

I may, however, opportunely add a word upon their geographical distribution. The remains practically consist of seven main groups, situated at wide distances apart and separated by obscure jungle paths. They are (1) the ruins of the hill of Pnom Krom and at Athvea, on the right bank of the Siem Reap River, near the lake. (2) The great temple of Angkor Wat, $3\frac{1}{2}$ miles north-west of Siem Reap. (3) The hill of Bakheng, $\frac{1}{2}$ mile north-west of Angkor Wat, and the multitudinous ruins contained either inside or immediately outside the vast enclosure of Angkor Tom, the royal city, situated a little further in the same direction. (4) The great lake and summer palace of Barai Mebom, about 5 miles to the west. All these are on the right, or west bank of the river. Then on the other or east bank are (5) the group containing the ruins of Prasat Kao, Taprom, Kedei, and the artificial lake of Sra Sang; (6) to the south of these, the brick group of Bachum, Mabon, and Prea-rup and; (7) considerably to the south of these, and about 8 miles almost due east of Siem Reap, the brick group of Lolei, Pra-ko, and Bakong. It is only by visiting all of these remains that the visitor can form a fair idea, not merely of the scope and range of the Khmer architecture, but of the different features that marked its rise, culmination, and decline.

(2) SIEM REAP TO BANGKOK.

The overland journey from Bangkok may be made by a traveller starting from that base for Cambodia, but will hardly repay any one who has already visited the ruins from Saigon. Nevertheless I append the stations and distances for the help of such as care to make the journey. It should be premised that careful preparations must be

made in advance, and every article of food, drink, and bedding procured beforehand.

The parts of Siam traversed are very sparsely inhabited, and the people in the villages are terribly poor; consequently nothing can be bought but an occasional fowl and a few eggs. The water is unreliable, and a filter is a *sine qua non*. The means of locomotion are ramshackle wooden carts or wagons drawn by oxen, which only make about 2 to 2½ miles in the hour, and rarely more than a stage of 16 miles in the day. If fortunate, the traveller will procure ponies for himself and servant; but these are not invariably forthcoming, and even if they are, little beyond comfort is gained by their superior pace, since a halt has to be made to enable the baggage to come up every night. Some persons purchase their own oxen and ponies, take them right through, and sell them at the end; but it is preferable to travel, if possible, with the assistance of the local governors (set in motion by the kindly offices of the Siamese Government), who have it in their power to provide carts, oxen, and ponies at each stage, or sometimes elephants. The latter, however, furnish a slow and tedious instrument of advance; nor is the seat on a Siamese howdah particularly comfortable. At night the resting-place is a *sala* or open rest-house. Some of these are in a state of utter decay, and the traveller may require or prefer to sleep in the open air. The journey is an uninteresting one, inasmuch as three days are spent inside the forest, where nothing at all can be seen, and four days in traversing an open plain covered with grass, which grows higher than the head, and equally obscures the view. After twelve or thirteen days, the duration being dependent on the season of the year and the state of the tracks, a point is reached, either, if there is sufficient water, at Paknam Kabin, or if not, then further on at Pachim, where a native boat can be taken, and the descent made by river to Bangkok, a distance from Pachim of 70 miles. The duration of the entire journey from Siem Reap will probably be about fifteen days, and for its successful prosecution are required a guide, who knows the route, and can speak Siamese, a decent cook, and considerable patience. These desiderata not being always forthcoming, the traveller who is without any two of them had better leave Angkor as he approached it, viz., by water through Cochin China.

ROUTE FROM SIEM REAP TO BANGKOK.

Siem Reap to Banpuok, 13 miles; Pumentik, 14; Tuk-cho, 13; Fra Neat Fra, 15; Sesupon, 14; Arranh Kao, 18; Arranh, 17; Wattana, 14; Ansinla, 14 (or Srakao, 20); Dong Khanh, 16 (or Patrang, 15); Kabin, 16 (or Kabin, 12); Paknam Kabin, 6; and thence by boat to Bangkok—or Chantakam, 20; Pachim, 12—total, 196 miles; and thence by river to Bangkok, 70 miles.

After the reading of the paper the following discussion ensued :—

MR. JOHN THOMSON: My exploration of Cambodia in 1866 is now rather ancient history, and my knowledge of this section of Eastern Asia is mainly confined to Siam, Cambodia, and Lower Cochin China. At that time I examined the principal antiquities, and made a detailed survey of Angkor Wat (properly Nakhon Wat), which enabled me to produce a ground plan of the entire building.* I took a large number of photographs both at Angkor Wat and Angkor Thom or "Inthapatapuri," the capital of ancient Cambodia. In this city distinct evidence is found of different periods in building, sculpture, and inscriptions, some of which had been partly translated at the time, denoting a higher antiquity than that assigned to them by Mr. Curzon. This view appears to be borne out by the Chinese annals. In the "Teen-hia-kwo-le-ping-swo," there is a note (date about 140 B.C.) on Cambodia under the name Chinla, a name by which the country is identified, and may be traced in subsequent Chinese writings, where it is also noticed under the names Funan and Kanpoji. The ruins are found as far north as Korat in Siam, further south than Angkor Wat, and extending over a wide area east and west. Many of the ruins are important, and are linked together by stone causeways raised well above the autumn flood levels, and were evidently intended and used by the ancients for extensive traffic from city to city. Adjoining the causeways one finds great stone reservoirs which must have been designed for use during the dry season, when water is scarce. Some of these reservoirs have the same characteristics in the mode of building as Angkor Wat. The quarries from which the stone was obtained are 30 miles distant from Angkor Wat, and one can hardly conceive of any means by which they could have drawn the huge blocks over hilly ground to the capital. The blocks used in building Angkor Wat are so closely fitted without cement that they must have been ground together, as the line of union is hardly to be seen. The stones in all cases were first fitted together and afterwards sculptured in a most elaborate and artistic manner. One sees in Angkor Wat evidence proving how closely it was allied to the Brahmanical cult, evidence which I published at the time. For example, a vast area of the walls of the temple behind its screens of pillars, is devoted to sculptured illustrations of the incidents in the poems, the "Ramayana" and the "Mahabharata," well-known to Oriental scholars. When in Cambodia, the King of Siam sent a special envoy to request me to photograph the entire series, a request with which I was unable to comply. At that time the kodak was unknown, and one had to depend on the collodion wet process of photography. This entailed the constant presence of eight or ten porters to transport the necessary apparatus. But the process had this advantage; as each plate was taken it was at once developed, so that one could see and judge of its value. I would have shown you a series of my photographs taken in 1866, but it is now too late to detain you. My original ground-plan of Angkor Wat may be seen in the adjoining room.

MR. ANNAN BRYCE: It has struck me, and I don't think this has hitherto been noticed by any one, that there are several points of resemblance between the ruins at Angkor and those at Pagan in Upper Burma. Pagan was for some centuries the capital of Burma, and was destroyed in 1284 by an army of Kublai Khan. There are resemblances not only in certain features of design, form, and decoration, but in the fineness of the work. It is difficult to insert a knife in the joints of some of the brickwork at Pagan, just as it appears from Mr. Thomson's account to be difficult to do so in the case of some of the stone-work at Angkor, and it is noteworthy that

* See Thomson's 'Straits of Malacca, Indo-China, and China.'

many of the buildings at both places must date from the same period. Some of these resemblances in style are apparent in Mr. Curzon's photographs, and in the book which I am glad to hear he is going to publish, I hope he will notice, and attempt to account for them. From a hint which Mr. Fergusson gives in his descriptions of Pagan and Angkor, it may perhaps be possible to find the link in the architecture of Kashmir, though Mr. Fergusson, who had not himself seen either Pagan or Angkor, does not appear to have thought of connecting the styles of the two places, which indeed have many points of dissimilarity as well as of resemblance.

Mr. VERNEY: I am here as the only European representative of the Siamese legation, and did not intend to speak, but I have much pleasure in thanking Mr. Curzon for the lecture he has given. The Siamese, I should like to inform you, are very proud indeed of being the owners of such ruins as we have seen represented to-night, and endeavour to preserve them intact. Until recent years, I believe, the very existence of these ruins was unknown to Europeans; we have with us one of the first of those who photographed them. I believe that Frenchmen have also taken admirable photographs and brought back good accounts of those ruins. I think we all might say how extremely obliged we are for the admirable way and graphic manner in which Mr. Curzon has told us what he saw, and I only wish that many Englishmen would follow in his footsteps, and that they may bring back not only the accounts of the ruins they saw but a great interest in these eastern countries which can do both the east and west nothing but good.

The PRESIDENT: Mr. Curzon has described his paper as dull. Whatever else it was I do not think that any of you will have found it that. I myself, when I heard that he was going to address us, knew that the paper would be extremely instructive, but I also knew that Mr. Curzon held very severe views indeed about the inexpediency of introducing anything that might at all detract from the strictly scientific character of our proceedings. However, the fact that he should have given us not only a very informing but a very amusing address only proves that as he is strong he is also merciful, and I am convinced that you will all desire that I give him your most hearty thanks.

The Hon. GEORGE CURZON: It is very true that I confessed a strong and scrupulous regard for the scientific character of our proceedings and our papers. As a matter of fact, the paper, as it will appear in the *Journal*, is scientific to the point of intolerable dullness, and it was merely the stimulus of this charming audience that tempted me to some of those concessions that have ruffled the scientific soul of our president. One word only in answer to the observations made as to the resemblance of these ruins to those of a temple in Burma. I thank Mr. Bryce for having mentioned this, as I consider it extremely worthy of study, and if he can supply me with photographs of them I shall be obliged, as they well deserve examination before one forms conclusions about the ruins at Angkor. With regard to what Mr. Thomson has said, I have only to reply that the transport of great blocks of stone by people at remote periods has to me never been a matter of much surprise. It merely requires a bank of sand, rollers, a pulley, rope, and the application of manual labour, to transport and elevate a block of stone half the size of this theatre. The people who erected these buildings had an unlimited supply of manual labour, and four or five thousand men would accomplish as well, though not with the same economy of labour, what is now done by a 200-300 HP. engine. As regards the extent of the site, I did not mean to say that the whole of the ruins were comprised within a space of 20 miles, because I have seen them at Kwin-hon in Annam that is over a stretch of country 400 miles broad. As any student of the question

would know, I was speaking of the ruins of the capital, not confined to the main temple, but including a group of buildings as extensive as London. As regards date, Mr. Thomson doubts my inference, for it was not more than an inference. The earliest inscription dates from about 600 A.D., and there are several inscriptions of about 890 A.D. on the later buildings, whose character is not such as to lead one to believe that there can be more than two hundred years between them and the main body of the earlier remains. In the days when Mr. Thomson was there not one inscription had been deciphered at all. I am obliged to Mr. Verney for the kind part he took in the discussion, and I hope that under the care of the Government with which he is connected in this country, these ruins may be preserved; but while these ruins are so well looked after the Siamese Government does not meet its responsibilities with regard to the others, and I should like Mr. Verney to write a despatch to that Government, urging it to extend the same care to the other ruins.

NOTE ON MAP OF FRENCH INDO-CHINA AND SIAM.—The map to illustrate the paper by the Hon. G. N. Curzon has been reduced from the last edition of M. Pavie's map. As the question of the boundaries is still under discussion none but those which have previously been definitely settled are shown on the map, such for instance those between Cochin China and Cambodia, and China and Tongking. The topography differs considerably from that shown in the maps previously published. This is especially shown on the east side of Mekong as well as in the course of that river itself. The present map also contains a large amount of detail in districts previously left nearly blank.

THE ZOUTPANSBERG GOLDFIELDS IN THE SOUTH AFRICAN REPUBLIC.*

By FRED. JEPPE.

THE district of Zoutpansberg embraces an area of about 25,000 square miles. It forms the northern portion and about one-fifth of the whole of the South African Republic. Of this large territory, exceeding the area of Holland and Belgium put together, the proclaimed goldfields cover about 3564 square miles.

The district is bounded on the south by the Olifants River, on the east by the Portuguese possessions, limited by the Lebombo Range, on the north by the Limpopo, on the north-west by the Magalakwin or Nyl River, and a line from this river to Yzerberg, thence along the mountain range to the Inkumpi or Zebedeli's River, and down this river to its junction with the Olifants. The district is divided into two portions, the Western or Highveld, and the Eastern or Low Country; in the latter the principal goldfields are found. Two great mountain

* Map, p. 288.

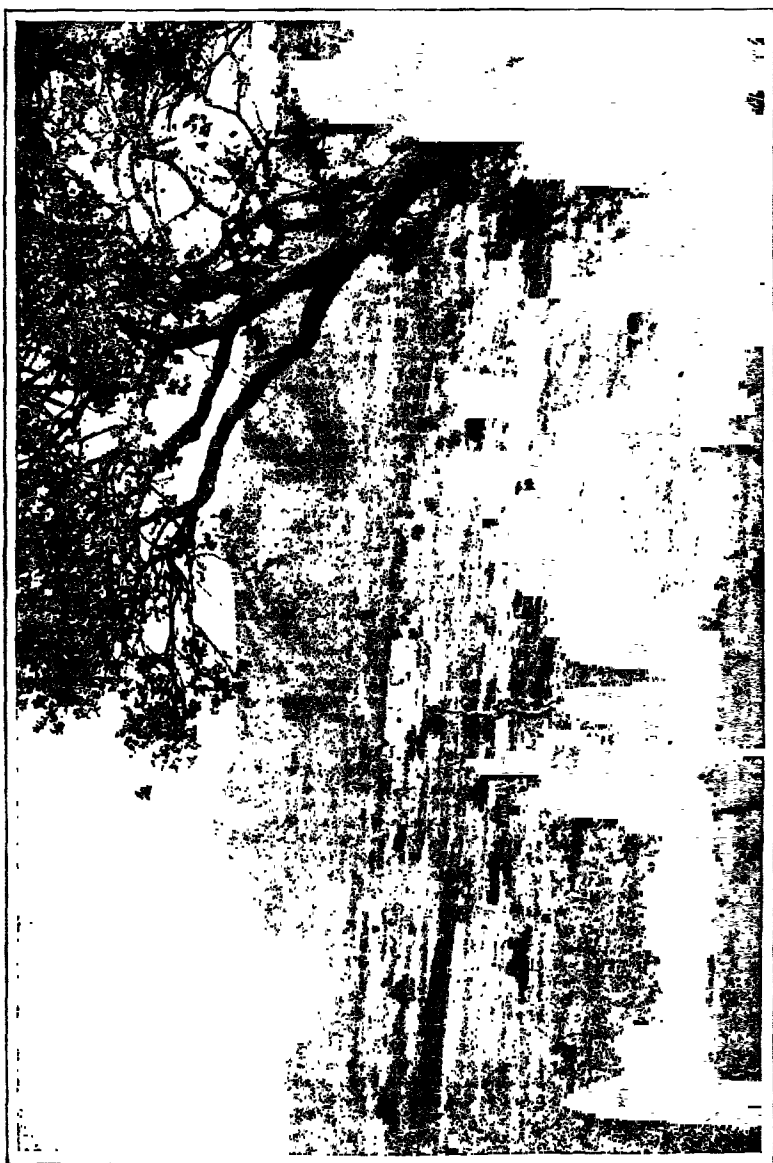
ranges, the Drakensberge* from south to north, and the Zoutpansberge from west to north-east, intersect the district. The Highveld is drained by the Zand and Hout Rivers, the Low Country by the Olifants, the Great, Middle and *Klein* Letaba and the Levubo with their numerous tributaries. The Levubo or Pafuri runs north-east and joins the Limpopo in lat. $22^{\circ} 24' 15''$ S. and long. $31^{\circ} 22' 39''$ E.† The three Letabas, united into one big river, join the Olifants in lat. 24° S. and long. $31^{\circ} 52' 49''$ E.

The history of the first occupation of the district by the Boers, in 1848, under Hendrik Potgieter, who fought their way to the north, is full of thrilling incidents worthy of an ample record by the future historian of the Republic. Surrounded and opposed by powerful native tribes, a handful of brave pioneers pushed on to the north and established a village on the southern slope of the Zoutpansberge, named Schoemansdaal. Here the small community lived and flourished surrounded by hostile native tribes. Rita Montanha,‡ a Portuguese priest, who visited the village in 1855, mentions the number of dwellings as two hundred and seventy-eight, accommodating a population of one thousand eight hundred souls, of whom three hundred were fit to bear arms. They lived principally from the proceeds of their hunting trips into the interior, bartering ivory and skins for guns, ammunition, groceries, and other necessities of life, with the Portuguese traders from the coast or with the inland merchants at Pretoria. In the year 1854, Hermanus Potgieter, a brother of Hendrik Potgieter, accompanied by his wife and children and some followers, were surprised by the natives at Moorddrift in Makapanspoort. The whole party was killed after being cruelly mutilated. When the news of these atrocities reached the authorities a *Commando* of Boers, consisting of five hundred men, under Piet Potgieter, Commissioner of Zoutpansberg, and M. W. Pretorius, of Potchefstroom, proceeded to Makapanspoort to revenge the murder of their relatives. The natives did not wait for the Boers, but fled into some large caves in the mountains; these were surrounded by the Boers in the hope that the natives would soon be forced to surrender for want of food and water. But it appears that the natives knew of some outlets unknown to the Boers, by which they managed to supply themselves with water. They held out for some time, but when Potgieter was fatally wounded, and the natives

* Dr. Rehmann says they ought not to be called "Drakensberge," but "Lechlaberge," as their geological formation is quite different from the Drakensberge at Lydenburg, consisting of much older metamorphic rocks. Dr. A. Rehmann, 'Das Transvaal Gebiet des südl. Afrika, in phys.-geog. Beziehung,' *Mitth. der k. k. geogr. Ges. in Wien*. Band xxvi, No. 8. 1883: pp. 377, 378.

† According to observation of Capt. A. Freire d'Andrade, member of the late Portuguese Boundary Commission.

‡ *Journal R.G.S.*, Vol. XXXII. 1862, p. 63.



WOODRUSH VILLAGE AND THE MICHIE OR WOODRUSH MOUNTAIN.

openly defied the Boers, calling upon them to come and fetch them out of the caves, the Boers determined to make an end of the affair. All the approaches to the caves were filled up with large boulders, and blocked up with wood, which was set on fire. In this way the whole clan, numbering some fifteen hundred souls, except a few who managed to escape, were either starved to death or suffocated by the smoke. Numerous skeletons and heaps of bones and skulls may still be seen in the caves. But the terrible revenge taken by the Boers had little effect on the natives, who were conscious of their vast superiority in numbers. The strife between the white man and the black was kept up for years until, in 1869, the Government resolved to abandon Schoemansdaal for a time. The inhabitants removed their furniture and everything else that could be moved, and retired to the southern portion of the district. But the people living in the valleys of the north-eastern portion of the district, called Spelonken, remained on their farms.

With the exception of the tribes under the powerful Chief Magato and a few of his underchiefs, all the natives of the district have submitted to the supremacy of the Government, and agreed to pay taxes. These are under the Chiefs Matala, Malitze, Machichaan (successor to Maraba), Chuni, Mapashlela, Malip, Mamabul, Legalie, U-Matiba, Matok, Ramagoep, Zegop, Mojaje, Tabaan, and other petty chiefs of the Knobnoses or Magwambas. The territories assigned to these chiefs are called *Locations*.* The location of the chief Zebedela is situated partly in the Zoutpansberg and partly in the Waterberg District, but has not been officially defined.

Negotiations are still pending with regard to the territory claimed by Magato, who occupies a stronghold in the Zoutpansberge, considered almost impregnable. The Republic has been several times on the point of deciding the dispute with this pugnacious and impertinent chief by force of arms, but the wish to avoid bloodshed and arrange matters in a peaceful manner has been predominant with the authorities.

Commandant Pretorius, who lately visited the mysterious chieftainess Mojaje, who is supposed to have furnished Mr. Rider Haggard with the subject for 'She,' describes her as a very old woman, with long, pointed, and crooked nose, long face, thin lips, closely-cropped hair, blue eyes, and almost white in colour. In spite of her bodily infirmities, she was received with great respect by the tribe.†

No proper census has ever been taken of the natives in the Transvaal.

* Marked in dark stipple in the map.

† The old lady turns out to be an impostor, being put forward by the wily Indunas as the original Mojaje, who died many years ago. In this way the Indunas collect a considerable revenue from credulous natives, who pay liberally for rain, the old chieftainess having been a great rain-maker in her time.

According to the last estimate, the approximate number of the native tribes living within the limits of the district is 382,328, consisting of 79,071 grown-up males, 100,723 females, and 202,534 children. The two principal tribes are the Basutos or Makatis, and the Magwambas or Knobnoses, the latter about 75,000 strong. The tribes living in the Zoutpansberg range are estimated by the German missionaries at 100,000 souls.

The white population is put down by the last official census at 4668, of whom 2732 are males, and 1936 females, the density of white population being 0.186 per square mile.

Numerous travellers have visited the district mostly on their way to the interior; but large tracts of country on the Eastern border are unexplored and only known to the hunters, who visit this part of the country during the winter season to hunt buffaloes, giraffes, rhinoceroses, and even elephants, which are still found in these regions. But owing to the tsetse fly and poisonous plants, these hunting trips have to be done on foot or with donkeys.

Livingstone is the first traveller on record who visited the district, which he did in the forties, but he did not proceed further than Makapanspoort, and Gassiot* is the second who passed through the South-Western portion of the district in 1851, on his way to the Limpopo. Rita Montanha,† coming from Inhambane, visited the settlement at Zoutpansberg in 1855; Logegary, a French Missionary from Basuto Land, passed through the Marabasstad district on his way to Mapela in 1858; Merensky,‡ in search of the ruins of Zimbabwe, discovered by Mauch in 1871, explored the district in 1862; Mauch in 1868, on his way to the interior, and Elton§ in 1870, in his trip from the Tati settlement to Delagoa Bay, explored the southern bank of the Limpopo. In the same year Button explored the region of the present goldfields, and a year later discovered gold at Eersteling, near Marabasstad. In 1872, Erskine,|| on his way from the Gasa country to Lydenburg, travelled along the banks of the Olifants River; Baines,¶ on his return from the Matabele country, crossed the Limpopo in lat. 22° 37' 40", and passed through Makapanspoort en route to Pretoria in 1870; Cohen** visited Marabasstad in 1873; Rehmann †† explored the district a few years later, describing its physical features in an exhaustive way never attempted by any other

* *Journal R.G.S.*, Vol. XXII. 1852, p. 136.

† *Journal R.G.S.*, Vol. XXXII. 1862, p. 63.

‡ *Erinnerungen aus dem Missionsleben*, A. Merensky, 1888.

§ *Journal R.G.S.*, Vol. XLII. 1872.

|| *Journal R.G.S.*, Vol. XLV. 1875, p. 45.

¶ 'The Goldfields of South Africa.' By T. Baines, London, 1877.

** 'Neues Jahrbuch für Mineralogie,' etc., 1873.

†† 'Das Transvaal Gebiet des südl. Afrika,' *Mittheilungen der k. k. geogr. Ges. in Wien*. Band xxvi. 1883.

explorer; Raddatz,* who died at Yzerberg in 1890, explored the southern portion of the district in 1885; and last, not least, the Brothers P. and H. Berthoud,† during their long residence in the Spelonken, explored the district in all directions, and published the first sketch maps of the district.

Of all these Logegary, who travelled through the country in 1858 in search of thieves, who had stolen a large sum of money and six horses from him, was the first who discovered gold in the northern part of the Transvaal. In a private letter addressed to the Government Secretary of the Republic, written at Secheli's in October 1858, he reports the existence of two goldmines in the Transvaal, and states that he is in possession of twelve samples of quartz containing gold. He does not name the locality where he found them, but as he travelled through Sekukuni's country and the Marabasstad region to Mapela's Kraal, it must be assumed that he found the gold along this route. He wrote: "You may believe that if the English knew of this, nothing would stop them in their march to the Transvaal," and he continues, "wherever there is gold there is nothing but murders, and I will not have the blood of any man on my head." But the government of the time, for political reasons, and actuated by the fear of seeing the country overrun by all sorts and conditions of men, had no intention of making use of the discovery. In 1854, traces of gold had been discovered on the Jokeskei River by a man returned from Australia; but a notice had been published that making known the discovery of gold would be punished with a fine of £500.

In 1868, Mauch discovered gold on the northern bank of the Olifants River, and marked the spot in his map, published by Petermann in 1870, as a probable goldfield. A year later the intrepid explorer Edward Button, travelling through the Zoutpansberg district, discovered gold in the hills on the *Klein* Letaba, which he named Sutherland Hills, and proceeding southward, he discovered auriferous reefs in a double chain of hills, named by him the Murchison Range. As Button was the first discoverer of gold in the Murchison and *Klein* Letaba regions, it will not be uninteresting to condense here a portion of his report to Dr. Sutherland, in Natal, written from Lydenburg in 1870, placed at our disposal.

"In 1869, at the kraal of the Kafir chief Sebulaan,‡ I found his people busy forging picks, etc., from ore of good quality, which is mined in the vicinity of his kraals. About 12 miles to the south-east we came to a group of hills formed of metamorphosed schists. The strike of the rocks is the same as the direction of the ranges of

* 'Das Kaffernland des unteren Olifant,' *Peterm. Mitt.* 1886.

† 'L'Afrique explorée et civilisée, Genève.' 1881, No. 8, and 1886, No. 10.

‡ Identical with Shivulaan on our map.

hills, viz.: west-south-west to east-north-east, true bearing, allowing 26° for variation. The strata are almost vertical; the dip, which is to the east, being hardly perceptible. The metamorphosed rocks in this group consist principally of chloritic and talcose slates, with numerous veins of quartz running through them, some of which are highly ferruginous. Intrusions of igneous rocks are also of frequent occurrence.

"We spent a few hours prospecting in one gully, found gold, but could not stay to make further explorations in this part of the country, the season being far advanced, and we also being short of provisions.

"Travelling thence south-east we found the gold-bearing belt to be flanked by gneiss, granite, and trappean rocks. The River Tabaan (Klein Letaba) appears to cut through the above-mentioned belt.

"Two days further on, after crossing the River Tabi (Great Letaba), we came to an enormous vein of quartz 150 feet wide, well cased in talcose slate, and towering some hundreds of feet above the plain. It forms a portion of another extensive chain of hills, and we named it Mountain Reef.* Travelling some miles over and across the strike of the beds of slate, we came upon porphyritic granite, with occasional narrow bands of chloritic slates, containing quartz veins and dykes of trap. Thence to the Palabora and Mashimala Hills, there is little variation in the rocks, the formation being essentially primitive. The Palabora country is rich in copper, and probably silver, tin, and other metals will be found there. Travelling several days through the Mashimala Hills, and crossing the River Selati, we emerged on the western side, thence to the River Makutzi, passing over extensive beds of talc schist, interstratified with bands of steatite, and occasional serpentine intrusions of igneous rocks. From the Makutzi to the Quathlamba gneiss and granite are the prevailing rocks. I returned to Lydenburg on October 8th, 1869.

"In June, 1870, I again left Lydenburg accompanied by a miner of twenty-five years' experience in New Zealand and Australia.

"At the point we crossed Olifants River, which is about 100 yards wide, we found fine gold in the crevices of the river-bed rock, also discovered an old working in a hill of chloritic slate, on the east bank, which from the stains around the shaft we concluded had been worked for copper. After crossing the Olifants we followed along its banks to the River Makutzi, passing some remarkable granite kopjes. Thence across extensive beds of what appear to be the oldest series of the metamorphic rocks, containing thick bands of quartzite, with some of the largest plates of talc I have seen in the country. We discovered no traces of gold here. Three days after crossing the River Selati, we came upon the auriferous chain of hills containing the Mountain Reef.

* This hill must be the Witkop, or Witkoppies.—F. J.

"Our anticipations regarding the extent and importance of this mineral belt were fully realised by subsequent exploration.

"My attention having been directed to this part of the country through reading an address delivered by Sir R. Murchison to the Geographical Society, in which he expressed an opinion that the Limpopo country would prove to be auriferous, we concluded to name this chain of hills the Murchison Range.

"It consists of a double range of hills, trending in the same direction as the metamorphosed rocks of which they are composed.

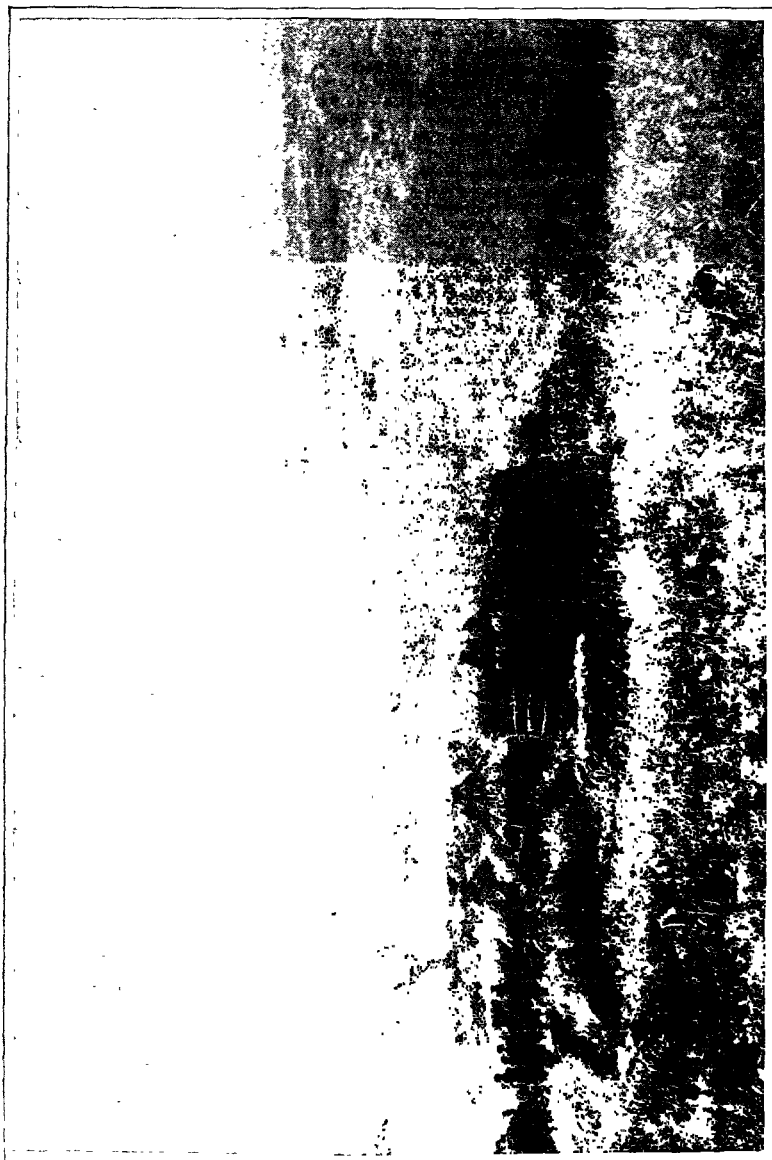
"The strike and dip of the rocks is the same as the Sutherland Hills; the two belts being parallel, but separated by many miles of granitic rocks. The Murchison Range covers a considerable extent of country. We travelled upon the veld passing Mountain Reef, and arriving at the Tabi Valley, found that the slates, with the exception of a few isolated hills, had disappeared apparently; probably removed by the erosive action of the ancient river-course. The denuded rock is gneiss; but across the river the range again assumes the appearance of a chain of hills. I left the gold formation here."

Mr. Button, by adopting another route discovered the Eersteling Reef, near Marabasstad, in August 1871. This discovery caused President Burgers, who was then at the head of the Government, to appoint the first gold commissioner. Claims were pegged, and the first gold law (No. 1, 1871 *) was promulgated.

For some reason or other mining operations at Eersteling were not crowned with success. Powerful machinery was obtained from Europe and erected at great cost, but the water was found insufficient for the requirements of the battery. No satisfactory results were obtained; then the war broke out, in which the machinery was destroyed by the Boers. Operations have since been resumed by the Balkis Company.

In September 1887, a block of Government farms comprising 76,320 acres was proclaimed and set open under the name of the *Houtboschberg Delverijen* (Woodbushberg Diggings), and in the course of the same year the private farms Frischgewaagd, Hartebeestfontein, Mynhardtskraal, southern portion of Zandrivier (in which Marabasstad is situated), Waterval, Roodepoort en Deelkraal (on which Smitsdorp is established), and a strip of government ground adjoining Roodepoort, were proclaimed as the Marabasstad Goldfields. To these was added a portion of the private farm Cyferkuil, and later on the so-called Selati Goldfields, extending south to the Olifants River, east to the junction of the Selati with the Olifants and the junction of the Great and Klein Letabas. The last-mentioned fields include the Murchison

* The first mining Ord., No. 5, 1866, referred only to mining of lead, copper, iron, tin, and other base metals. In case of precious metals being found notice had to be given to Government.



THE SWAHA PEAK, ZOUTPANSBERG.

Range. By the last proclamation of October 18th, 1892, the proclaimed territory has been extended to the north, beyond the Klein Letaba, as far as Rebanga.* This territory comprises six distinct goldfields known by the name of Smitsdorp, Houtboschberg, Thabine (between the Thabine and the Letsitele Rivers, both tributaries of the Great Letaba), Selati, Molototsi, and Klein Letaba. Officially these fields are now recognised under the name of the *Zoutpansberg Delverijen*.† The seat of the Gold Commissioner, formerly residing at Leydsdorp, has been removed to Pietersburg, but subordinate officials for the issue of licenses and other departmental work are placed at Leydsdorp, Haenertsburg, and at Birthday Camp, north of the Klein Letaba.

Smitsdorp, formerly the centre of a flourishing mining centre, is now almost deserted, after the removal of the Gold Commissioner to Pietersburg, the chief town of the district. Dr. Mathews, who lately passed through the village, met only three persons, the hotelkeeper, telegraph clerk, and a traveller.‡ *Pietersburg* is also the seat of the Landdrost of the district, whose office is combined with that of Gold Commissioner. It lies on the banks of the Sterkloop, a tributary of the Zand River, about 12 miles north of Smitsdorp, and was formerly called Upsala by the owner of the farm, who was of Swedish descent. It has three churches, two banks, decent public buildings, eight stores, about three hundred dwellings with about seven hundred inhabitants. It boasts also of a newspaper, called the *Zoutpansberg Review*, which was the most northern paper published in South Africa until the *Rhodesia Herald* was started at Fort Salisbury.

Marabasstad, the oldest settlement of the district and formerly the seat of the Landdrost, Haenertsburg, about 30 miles east of Pietersburg, Houtboschdorp, about 12 miles north of Haenertsburg, and Leydsdorp, about 50 miles east of Haenertsburg, all consist of a few houses only and some stores constructed of corrugated iron, or wattle and daub. New Agatha, close to Mamatola's kraal on Mafefere's mountain, completes the list of villages. It consists of a post and telegraph office, and a canteen. The old village of this name was laid out on the northern bank of the Thabine, but found too unhealthy.

All these places, except Houtboschdorp, are connected by telegraph,

* This proclamation defines a much larger territory than is given in the map, including many private farms, occupation farms, and native locations, which are precluded by the same proclamation from the operation of the gold law. The whole of the eastern line of the goldfields from the junction of the Selati with the Olifants southward to Rebanga can only be given approximately, as no proper survey has been made.

† The following private farms have lately been proclaimed: Potsdam, Burgersdorp, with the celebrated Swiss Reef, Sedan, and Tours.

‡ Smitsdorp, says the *Review*, is now wakening up, and is all excitement in consequence of the hundreds of alluvial claims now being pegged on the farms Waterfall and Frischgewaagd.

and a telephone has lately been established between Agatha, Burgersdorp and Leydsdorp. The Birthday and Ellerton mines will also soon be connected with the general system.

The whole territory defined in the proclamation * consists of Government lands, except the private farms near Marabastad and elsewhere, mentioned before. The remaining portion of the district, to the east of the proclaimed goldfields as far as the Lebombo, and to the north as far as the Limpopo, except, perhaps, a hundred private farms between Yzerberg and the Zoutpansberg range, is also government ground still unproclaimed as a goldfield, but the government have granted prospecting concessions, extending over two years, within the limits of this territory. Each concession comprises an area of about 200 square miles. Eight of these concessions have been amalgamated under the name of the Singvedsi Prospecting and Exploration Company.

It will be observed in the map that the line of the proclaimed goldfield passes through a portion of the locations granted to the Knobnoses and the chief Tabaan, which, like all other locations, are precluded from the operation of the gold law. Before the above-mentioned locations were beaconed off, a number of prospecting claims were pegged within their limits, and the owners of these claims are said to object to the ground being given to the natives. But the native chiefs, to whom the locations were allotted, have granted to certain parties prospecting and mining privileges on reefs that may be discovered within the limits of their locations.

In the year 1888-89, the time of the great boom, a rush took place to the Murchison Range. Hundreds of claims were pegged along the gold-belt extending from Leydsdorp to Witkop, a distance of more than 40 miles. The correspondent of a local paper, who visited the locality in 1889, described the working of about one hundred and twenty companies holding claims along the range as shown in Loveday's maps. Of these forty-four were still at work in June 1892. Mr. Sawyer† in his pamphlet gives the names of forty-five claim-holders that were working towards the end of 1891. The reason for this is not the absence of gold, but the great natural drawbacks, such as scarcity of water, great distance from the sea-coast, and consequent high cost of transport and provisions, the hot climate and risk of fever during the summer season.

But in spite of all these disadvantages, and the greater attraction and facilities of mining at the Rand, the Zoutpansberg fields are gradually and steadily gaining public attention. Old abandoned claims are being taken up and worked with greater energy, particularly since the great

* Marked in yellow colour in the map.

† A. R. Sawyer, 'Geological and General Guide to the Murchison Range.' London, J. Heywood, 1892.

success that attended a mine on the Klein Letaba, and the sensation caused by the discovery of a rich antimony reef.* The Klein Letaba region offers exceptional advantages and facilities owing to its abundance of water and comparatively easy accessibility. The river runs through the auriferous region, and has, even in the driest season, a sufficient supply of water to work the stamps. There is abundance of fuel, as the neighbouring country, in fact the whole of the low country, is thickly wooded, supplying firewood and any quantity of timber suitable for mining and building purposes. Mr. Sawyer, in his guide mentioned above, enumerates about twenty different kinds of woods, but the local names he gives are mostly incorrect.† A good number of other kinds, not mentioned by Mr. Sawyer, may be found in a list published by the writer ‡ in 1876.

There is an abundant supply of labour, as the Zoutpansberg district is the most densely peopled of all the districts of the Transvaal, its natives forming 59 per cent. of the total population of the country. The natives are respectful and obedient to the whites, supplying them with milk, butter, eggs, fowls, etc., on reasonable terms. Wages range from fifteen to twenty-five shillings per month, and the demand is small compared with the supply. The Rev. P. Berthoud divides the natives into two distinct races: the Basutos or Bavendas, speaking the Sesuto language, and the Magwambas speaking the Sigumamba dialect. The latter fled from the east to escape the tyranny of the Amatonga chiefs living on the sea-coast. He calls the Magwambas a proud, unruly race like the Zulus, but very desirous of being taught. They wear a girdle made of skins with tails of wild animals attached, are very fond of feathers and ornaments; their war arms are shields of skins and assegais; human life has no value in their eyes. The Basutos are a gentle pastoral race, much more amiable than the Magwambas, but less eager to be educated.§

With regard to water-supply the Murchison Range is at great disadvantage compared to the Letaba region. The Melati is not a perennial stream, supplying water during the winter season in pools only, and the Selati River can only be reached by crossing the Spitzkop range. Boring and well-sinking has been resorted to. Mr. Sawyer says

* Assays made of samples showing *no visible gold* gave 5 oz. 8 dwt. 18 gr. and other samples with *visible gold*, 18 oz. 12 dwt. 12 gr. per ton. The antimony contained in the ore consists of sulphide and oxide of antimony. The former is perfectly pure, and contains 71·40 per cent. with 28·60 per cent. sulphur, the latter 93·60 per cent. of oxide with 6·10 per cent. silicates.

† The correct names are Wachteenbietje, Wilde Druive, Waterboekenhout, Boekenhout, Swarthaak, Wilde Vyge, Kremartaant, Rooibosch, Knoppiesdoorn, etc.

‡ "Notes on some of the Physical and Geological Features of the Transvaal." By Fred Jeppe. *Journal R.G.S.*, Vol. XLVII., 1877.

§ *Les Speloukenen*, 'L'Afrique Explorée et Civilisée,' Ferrier, 1881, p. 163.

that at the La France mine water was obtained at a depth of 130 feet, and at the Renown, three miles north-east of Leydsdorp, sufficient water for thirty Kaffirs and some cattle was obtainable all the year round from some springs close by. But, he says, at most of the camps water has to be fetched from the Selati.* He speaks of the Roviwater (correctly Rooiwater) as a sluit containing water both in summer and winter, possibly the upper portion of the Melatie. Loveday's map shows a stream in the same position with the name Dwars River, but shows it as running west into the Thabine. It is said that there are no engineering difficulties in the construction of a canal from the junction of the Letsitele with the Great Letaba to the Murchison Range.

Mr. Halder, a mining engineer resident on the fields, says that the Great Letaba is a stream of 24,000 cubic feet in the winter season, and at some places there is a great fall. The average fall per mile over 60 miles of the Great Letaba is 21 feet, but for a few miles there is a fall of 60 feet per mile. The Selati River is useless for motive power.

Mr. Halder mentions that the Murchison Belt has been found by numerous hunters in Portuguese territory in the neighbourhood of Fraka (*Fiaca* is shown in the Portuguese maps on the left bank of the Limpopo, in lat. 23°).

The completion of the Selati Railway from Komati Poort to Leydsdorp will, no doubt, give a great impetus to the mining industry. This line, which was commenced some months ago and is pushed on with great energy by the Belgian engineers, will place the Zoutpansberg fields in direct communication with Delagoa Bay, a distance from Leydsdorp of 254 miles by rail. The line branches off from the first Transvaal station on the Portuguese border at Komati Poort, crosses the Limpopo River close to this station, and following the watershed between the Limpopo and Olifants Rivers crosses the latter near the junction of the Selati, and skirting the southern bank of this river approaches Leydsdorp from the south. This is the line as originally contemplated and surveyed. But as all the mines are situated between the two ranges, the Murchison and the Spitzkop, it has been resolved on the proposal of the State mining-engineer, Mr. Klimke, to bring the line nearer to the mines by crossing the Olifants River a little below the junction of the Selati, and by passing near the old mines of Palabora to bring the line between the two ranges to a point near Leydsdorp that is easy of access for future extension to the north and west.†

The observations on the geological features of the Murchison

* A. R. Sawyer, 'Geological and General Guide to the Murchison Range.' London, 1892: pp. 68, 69.

† The line may be extended to the farm of Tours.

Range quite confirm those made by Mr. Button in 1869. Mr. Alford * says:—

“The Murchison Hills are formed of the eroded remains of quartzose-clay shales, schists and mudstones, resting upon the granites and plentifully intercalated with quartz. Imbedded in them are masses of boulders of quartzite, the broken remains of what were probably once interstratified beds of that rock—the whole formation being very much broken and dislocated by frequent and large irruptions of trappean rocks. Gold occurs in the quartzite masses, in the intercalated quartz veins, and in many of the surface deposits with which the granite is covered. These deposits are often exceedingly rich, and many would pay well if worked out by a few industrious men with a very small expenditure of capital. In these rocks the gold does not appear to enter into the composition of the rock, as in the case of an ordinary mineralised quartz, but occurs in nuggety impregnations distinctly visible to the eye, and thus giving to the observer an idea of great richness which is sometimes not borne out on assay. The dip of the strata, where it is ascertainable, is to the south, the rocks having been upheaved from the north. From the position of the drift beds I also judge that the general direction of the denudation has been from the north and north-west.”

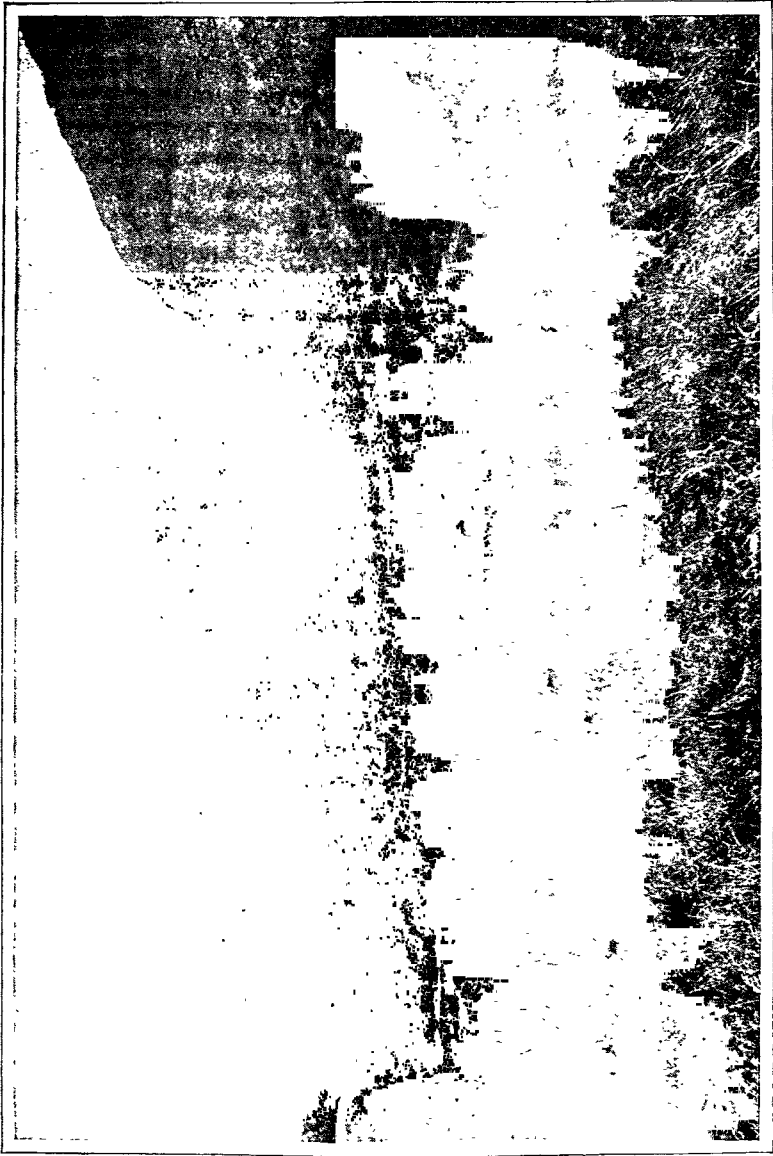
Mr. Sawyer † goes more into detail. He says:—

“The Murchison Range, or Selatie field, is the southern of three gold-bearing belts, running almost parallel in a south-west to north-east direction. The northern belt comprises the Klein Letaba goldfield. An intermediate small belt occurs north of the Molototsi River. The gold-bearing zone of the Murchison Range averages 6 miles in width and about 50 miles in length, from the Selatie gold mine to Witkopje. The Murchison Range consists of various crystalline and metamorphosed rocks of great age, including talc schist, chlorite schist, clay slate, clay (sometimes remarkably soft), talcose sandstone, fine-grained laminated sandstone, hornblende schist, tremolite schist, talcose schist, pink and green quartzites, calcareous sandstone, talcose limestone, grit, quartz-schist, and various others. . . .

“Numerous deposits of calcite and dolomite were found in the long tunnel at Shotover amongst the chlorite schists. Large quantities also occurred in the reefs there. Peculiar large nodules of fine-grained sandstone mixed with chlorite, which gave it a spotted appearance, were also found embedded within chlorite schists in that tunnel. They were enclosed in dark green chlorite, which was about 3 or 4 inches

* “Notes on an Expedition to Zoutpansberg,” by C. F. Alford, F.G.S., *Witwatersrand Mining and Metallurgical Review*. See also ‘Geological Features of the Transvaal,’ by the same author. October, 1890. London, Edward Stanford, 1891.

† A. R. Sawyer, A.R.S.M., F.G.S., ‘Geological and General Guide to the Murchison Range.’ J. Heywood, London, 1892.



MANHOPE, EXTREME WESTERN TERMINATION OF ZOUTPANSBERG RANGE.

thick. One was lenticular, 32 inches in depth and 12 inches thick in the middle. The other was 4 feet in depth and 3 feet in width. It was in other respects similar, except that part of the sandstone had been altered to quartzite. The chlorite schists contain much oxide of iron, and consequently have a spotted appearance.

"The quartzites of which Spitzkop is composed are of various hues and texture. Some are foliated, others schistose; some are massive, without showing any lamination. The former are mostly green, the latter brown and black, with white quartz veins running through their mass.

"The quartzites forming part of the Lion Kopje at La France are similar in many respects, but some strata are quite sea-green and others rosy-red.

"These rocks have been tilted up at angles of from 60° to 90°. Their strike is parallel to the range, and is remarkably regular for its length, though these rocks are folded and contorted in places. The range is bounded to the north and to the south by granite, and to some extent by gneiss. The felspar is usually white, and occurs frequently in large well-defined crystals, resembling those of the Land's End. The mica also occurs frequently in large flakes; fine-grained granite and pegmatite also occur. Granite also shows itself within the belt in various places, at a spot 3 miles north of Leydsdorp, to the south of the Daisy Claims, and a few miles west of the old Spitzkop store on the abandoned Horseshoe Claims. Granite and gneiss intervene between the three belts."

Mr. Sawyer does not see how the goldfield can be generally prospected by individuals. This, in his opinion, can only be done by large companies. Whilst individuals can only obtain results near the surface, which are often misleading, rich companies can afford to prospect on a large scale, and at fair depths, and this is the only satisfactory mode of doing so. The long grass makes surface prospecting almost impossible in summer, as rocks are hidden by it. Deposits of alluvial gold have hitherto been found in two or three places only, near the boundary of the farm Tours in the Drackensberg Range, and on the farms Frischgewaagd and Hartebeestfontein in the Smitsdorp goldfields.

Mr. Braecke, who has spent some time in the development of the Gravelotte Reef, says that in the future of the low country development and working of the gold-bearing veins, it will be the scientific miner who will obtain the best results, for he will be able to select the chutes of rich and payable ore, leaving the very low grade ore as pillars, and so reducing the cost of mining, timbering, and treatment, while increasing the return of metal per ton.

Mr. Braecke has sunk two shafts in the valley between the Murchison Range proper and the Spitzkop Mountain. These shafts are 500 feet apart, and in each case and at the same level, viz., about

50 feet into the bed rock, which consists of talcose and chloritic slates cut by dykes of porphyritic diorite, he obtained water in abundance.

Speaking of the Klein Letaba fields, Mr. Halder says: "The formation of the Sutherland Range is somewhat conformable with the Murchison Range, with the exception that the gold-bearing strata or slate belts are more broken by masses of intrusive dykes, and sometimes make prospecting rather difficult. In the Sutherland Hills the formation is beautifully stratified, giving distinct appearances of its strike. Some good properties have lately been discovered in the hills themselves. It may be safely stated that the slate belt or auriferous strata commences in the Drakensberg, some 20 miles west of the Ellerton mine."*

The Birthday Reef forms the centre of a large number of claims belonging to different small companies. Most of these have lately amalgamated into the Letaba Gold Mining Company.

The output of gold in the Zoutpansberg mines shows that mining is still done on a small scale compared to the brilliant results of the Rand and the steadily-increasing output of the Kaap goldfields. In 1890 the total output was 9480 oz. 12 dwts., and in 1892 16,107 oz. 18 dwts. The following table compiled from the official returns, published by the Mining Department, gives the results of the different Zoutpansberg goldfields during the year 1892:—

Goldfield.	Average Number of Men Employed.		Number of Stamps.	Tons			Gold obtained.	Value.
	White.	Colored.		Excavated.	Crushed.	Washed.		
Marabastad .	11	78	50	1,796	2740	770	oz. 1,023 9	£ 3,582
Houtboschberg	4	23	45	19,391	311	—	372 11	1,303
Klein Letaba .	26	186	10	6,190	3869	—	14,693 16	51,428
Selatie . .	23	93	18	1,573	52	—	18 2	63
Total .	64	380	123	28,950	6972	770	16,107 18	56,376

The output for the entire Transvaal is given by the Chamber of Mines † as 1,325,394 oz. for the year 1892, comprised as follows:—

	oz.	dwts.
Witwatersrand	1,210,868	16
Kaap goldfields	63,125	3
Lydenburg	24,092	2
Carried Forward	1,298,086	1

* A reference to the map will show that, according to Mr. Klimke, the territory between the Drakensberg and the Ellerton mine is a gneiss formation without any indication of metallic veins.

† Fourth Annual Report by the Chamber of Mines, Johannesburg, for the year 1892.

			oz.	dwt.
Brought Forward	..	..	1,298,086	1
Zoutpansberg	..	..	16,107	18*
Klerksdorp and Potchefstroom	..	..	8,967	17
Malmanie	..	..	2,060	19
Vryheid	..	..	81	10
Total	..	..	1,325,304	5
Value	..	..	£4,638,880.	

Besides gold the district is rich in other ores, such as iron and copper, also lead, and probably silver and tin. The two former metals are worked by the natives in a crude, primitive fashion. The furnaces in which the ores are smelted are made of clay a few feet above the ground, of square or circular shape, with a slot on one side. Through this aperture an earthenware pipe is inserted, attached to bellows made of skins, by which the blast is applied to the furnace. Out of the iron assegais, hatchets, and other weapons, and hoes for tilling the land, are made. The copper is worked into bangles and other ornaments worn round the neck, wrists, and ankles.

In the Palabora district extensive old workings are found in the Umhululu or Lole Mountains, with deep shafts surrounded by piles of *débris* and slag. The workings must be very old, as big trees are growing in some of the holes. A recent traveller thus describes the old workings:—

“Above the prevailing flatness of the land rise weird, uncanny-looking kopjes of granite and syenite, of grey and red and green; sometimes alone, sometimes in groups of three and more, clad with thick bush about the base, and flaunting huge weathered masses of strangely-shaped rocks on high.

“A gentle rise of 200 or 300 feet brings one to a small inter-montanic creek, immediately above which one sees the first of the much-talked-of workings. From here, right up to the neck, and then along the greater axis of the hill, north and south, over the crest and all down the eastern side, here, there, and everywhere are holes and cuttings, shafts and tunnels, of all sizes and shapes. The hills are well mineralised, and in more than one zone, so that no attempt to find ore on the part of the workers has been altogether unfruitful. No systematic plan has been followed, and although a rough attempt has been made to follow the main outcrop on the crest of the hills, the chief idea has evidently been to get ores wherever there was the slightest opportunity offering.

“There are dozens and dozens of holes, mere circular pans, a foot or two deep and a yard or two in diameter; there are shafts twenty

* Of which the Birthday shared 13,618 oz. 5 dwts.

feet deep; cuttings of several score of yards in length, and 25 to 30 feet in depth; there are tunnels—not many it is true, but one or two of small dimensions and doubtful utility—and there are piles of *débris* wherever one turns. Thousands upon thousands of tons of ore have been removed; hundreds of hands, in the aggregate, must, at some time or other, have been scraping and digging and hammering away at countless points upon the hill of Lole.

“The gangue of the ores appears to be of calcespar and a silico-calcareous rock; it is very white and compact, and glistens and gleams in the bright sunshine like purest crystal. The ores are many, and, at the present time, have not been fully determined, so that caution prevents one from stating definitely what they are. Magnetic iron ore is in great quantity; manganese is to be found; copper sulphides, carbonates and silicates occur in small nests and thin veins; a little copper oxide (cuprite) has been found, and pretty specimens of a copper or uranium mica are to be obtained in many places. Other minerals may be ascertained when careful analyses have been made.”

A short time ago some sensation was caused by the discovery of mercury on the farm Doornfontein, near Pienaars Nek. The metal is said to occur in its native state in vast beds of ore covering over a square mile of ground. The dip of the beds is at an angle of about 45°. The theory, as set forth by a writer in a local paper who visited the spot, is, that this porous honeycomb rock has been thus largely impregnated with quicksilver by volatilisation from beds just beneath the immediate surface, the sandy ore acting as a condenser. A syndicate has been formed to open up the property. The ore was, it is said, discovered on this and the neighbouring farm Schaapplaats by Mauch in 1867, in one of his journeys to the north.

Professor Cohen in his exploration of Marabastad in 1872, mentions the discovery of a small vein of pure silver.

Rumours of the discovery of diamonds in different parts of the Zoutpansberg district have been heard for years. In the neighbourhood of the great Saltpan on the western extremity of the Zoutpansberg Range, a little beyond the margin of our map, prospecting for diamonds was carried on by experts from Kimberley, but without any satisfactory results being achieved. The soil within a radius of 10 miles from the Saltpan was considered identical with the blue ground of Kimberley. Small diamonds were actually found, but the search was abandoned for a time, the prospectors being convinced that the matrix would be discovered one day.

Although the district offers exceptional facilities for agricultural pursuits, the farming population is the most poverty-stricken, indolent, and unproductive of the whole country. All breadstuffs have to be imported at great cost over bad and dangerous roads, which, of course, is a great drawback to the mining industry. The original voortrekker looks

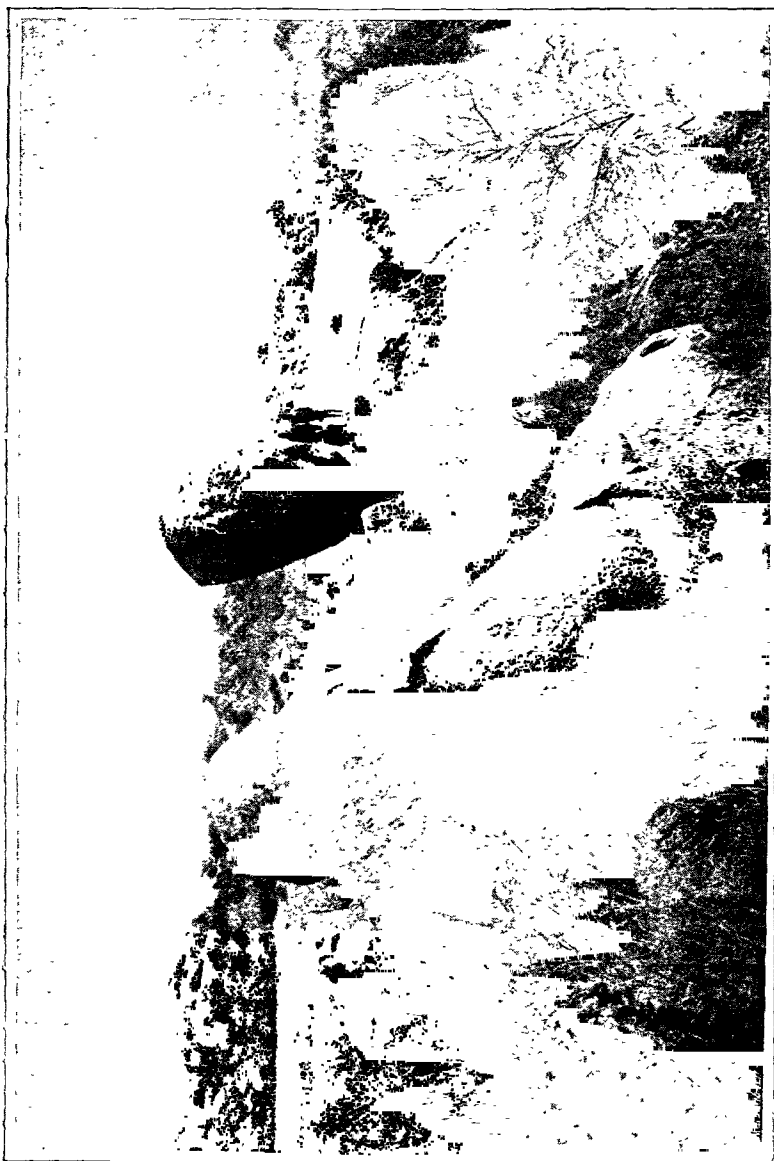
with suspicion on the new comer, who disturbs the even tenor of his sluggish existence. He has no enterprise or ambition. He grows hardly as much as he wants for his own consumption, and spends the best part of the year in the *Jagdveld*. The rich alluvial soil of the valleys in the Spelonken is admirably fitted for the growth of coffee, sugar, and other tropical products; but few attempts have been made on a large scale. There is an abundance of water from the numerous tributaries of the Levubo and Klein Letaba.

The habitations of the European residents of the Spelonken are however, well cultivated, such as the homesteads of the Swiss missionaries P. and H. Berthoud, at Waterfall (Elim) and Valdezia, and especially the beautiful estate Lovedale Park, belonging to Mr. Cooksley. The farm Goedewensch, below the slopes of Pisang Kop, the residence of the late Portuguese Consul Albassini, was formerly considered one of the finest properties of the Spelonken, where coffee trees and other tropical products were cultivated; but since the death of the Consul the estate has been greatly neglected. A new township, to be called Maréville, is now to be laid out on the farm.

The unhealthiness of the climate during the summer months is also a great drawback to the development of the district. Fever was particularly bad last season, but it has not been confined to the Zoutpansberg district only. On the railway works in the Elands Valley and near Barberton fever has been exceptionally virulent, taking away people in prime of life, and causing great distress. Speaking of Klein Letaba, Dr. Mathews,* who lately visited the camp, thinks that exaggerated reports of the mortality occurring there had gained too much credence. The deaths up to the time of his visit had been among those living more or less precariously and carelessly, only one man in the Company having died. He says the sickness, nevertheless, is excessive, the doctors and others informing him that, with the exception of the manager, not one single man employed on the mine had escaped an attack of fever more or less severe. Though mining in the tropics, he found that the men did not present the washed-out appearance of Anglo-Indians, and all were in capital spirits.

Mr. Sawyer, who lived two years on the Murchison Range, informs us that the climate during the winter is pleasant and healthy; there is little rain, the days are hot but the nights cold. Great changes of temperature are experienced at all seasons, which, without proper precautions, cause fever and other sickness. During October, 1890, the rainfall was 1·60 inches, the lowest minimum temperature at night 51° F., the highest, 67°. In November the total rainfall was 5·05 inches, and the average temperature during the day 107°. In December 2·41 inches of rain fell, and the average temperature for that month and January

* Author of 'Inwadi Yama.'



ELAND'S KOEJES, DUUR-EN-DUUR.

was 106°; 9·89 inches of rain fell during January. In February, 1891, the heat was excessive, the maximum temperature during the day ranging from 134° to 85°, the average being 114°·8; 14·87 inches of rain were registered during this month. In March there fell 1·87 inches only, and the average temperature was much reduced. There was hardly any rain in April (0·2), the average temperature during the day being 108°, during the night, 49°.* Mr. Sawyer holds that, though there is danger of catching fever during the rainy season, immunity can be secured by attention to ordinary rules of health, by retiring at sunset, not rising too early, abstaining from spirituous liquors, and choosing a high residence. He lived near Leydsdorp during the summers of 1891 and 1892 without getting a touch of fever, and quotes instances of Europeans living there for years without being attacked. Mr. Sawyer maintains that when the long grass† is regularly burnt down fever will become practically non-existent. The fever is said to be a climateric intermittent fever, not strictly malarial, like that contracted in other parts of the district, and rarely proves fatal if proper attention is given.

The scenery of the Low Country is grand and beautiful when it bursts upon the weary traveller after passing the dreary, monotonous plains that intervene between Pietersburg and the Drakensberg Range.

Standing on the brink of the range where the road leads down to Buffels Kraal, on a long spur of the mountain, a glorious view is obtained of a large stretch of the Low Country as far as the Lebombo or Longwe Range to the east. The whole basin seems one endless mass of bush, broken here and there by small mountain ranges and single kopjes, peeping out like islands in the sea. The road leading through the bush reminds one of an English park, were it not that the big ant-heaps, the unwieldy baobab, and picturesque euphorbia, remind the traveller that he is in South Africa. Looking back towards the west after descending the road, the mountain range towers above like a gigantic wall with castellated krantzes and deep bush-clad ravines. No towns or villages meet the eye, not even the elephants which according to Swift took their places in the maps, the solitary homestead of a farm with a few acres of cultivated ground, or a Kaffir kraal with naked, dirty children and barking dogs playing about, is passed at long intervals. Nothing disturbs the vast solitude but the flutter of bright-coloured birds or the rush of the light-footed buck as he speeds through the bush. The ravines are thickly covered with rank vegetation growing with tropical luxuriance. Ferns are found here in great variety, from the big tree-fern to the tiny maidenhair,

* The author does not mention how these averages were obtained. The figures of temperature must consequently be received with great caution; the true shade-temperature would probably be considerably lower.—Ed.

† He quotes an instance where he found grass of 15 feet high near the Thabine.

interspersed with bright-coloured wild flowers. Birds of brilliant blue and red plumage flutter among the branches of the acacias, which are festooned with creepers in dark and light green; troops of monkeys gambol chattering among the rocks and trees.

"But this bright scene of fairyland is not without its shadows. Horse sickness prevails in these valleys, and the deadly *Tsetse* is found in some parts. The bright carpet under our feet contains poisonous herbs, fatal to cattle, among the lovely ferns and shrubs lurks the venomous snake ready to leap upon the intruder, on the branches of the trees crouches the vicious leopard watching for his prey. The bright-coloured flowers have no scent, the brilliant-plumaged birds no song."

The views obtained in some of these bushy ravines are extremely beautiful. The ubiquitous photographer has already picked out some of these scenes with the genius of an artist. The views taken by Messrs. Gros and Exton in these parts are selected with true artistic taste and skill.

There is a strange fascination in the South African landscape. The plains could not perhaps be compared with the vast American prairies, nor the mountains vie in grandeur with the Alps, but there is a peculiar charm which strikes the new comer when seen at first, and of which the old inhabitants never tire. Mr. P. Berthoud, a native of Switzerland, in speaking of the Zoutpansberg mountains, says in his paper quoted before,* that they recall the Jura rather than the Alps.

The cartographer has the same difficulty here as elsewhere in choosing the names of rivers, mountains, and localities, as so many different names exist for each. This is partly due to the nationality of the traveller or explorer, and partly to the different dialects used by the native tribes inhabiting the district. According to the decision of the Geographical Congress at Paris in 1889, new names are to be given only in the absence of native names, but the difficulty with regard to the old names remains: whether to adopt the version of the Makatis or that given by the Magwambas. And to make it more difficult some of the names given by the Bangais when they inhabited the country are still used by both the Makatis and Magwambas. There is also a great difference in the way native names are written by the German missionaries and those given by the Swiss missionaries, as will be observed if Berthoud's map of 1886 is compared with Knothe's map of 1889, published in *Petermanns Mitteilungen* in 1890, and Raddatz's map published in 1886.

Mr. H. Berthoud, who has been living at Valdezia for more than twelve years among the Knobnoses, says the German missionaries use the *w* not as the English but as the German *w*, which is a real consonant, a pure labial—not dento-labial sound. He also

* "Les Spelounken." 'L'Afrique Explorée et Civilisée,' Genève, Février, 1881.

shows that there are sounds in the native language like the *w*, that have no correlative sound in the European languages. Thus *Ngoa* of the German missionaries is written *Niva*, the *ñ* being the guttural *n* according to the standard alphabet of Lepsius, adopted by nearly all the mission societies. Thus the *Ng* is one sound *ñ*, the *n* guttural, and not two sounds *n* and *g*. Lake Ngami ought to be written *Nami*, Shoshong *Šošon*. But as it is difficult to adopt these letters in print, we are obliged to translate native names into common language, and here the differences are often very great.

Some travellers make the consonants harder than they are, like the Germans; English travellers write mostly phonetically,* but sometimes according to no rule at all but their own sweet will. The *Observation Hill* of Loveday's map is called Shirulurulu by the natives, and they have two hills of this name close together, calling the one the Shirulurulu of home, and the other the Shirulurulu of up-country. Now which of the two is Observation Hill, and how many hills are there in that part of the country from which observations might be made? Another instance is the river called *Mosunguludzi* by the natives, a branch of the Middle Letaba, to which the Boers have given the horrid name *Brandboontjes*. The range of hills named *Diorite* or *Black Hills* on all maps is called *Molembye* by the natives.

The following are some instances of the different names given to one and the same locality :—

Makatise.	Magwambas.	Local Dutch.
Ningo-e-Kolo . . .	Yingwekulu . . .	Yzerberg
Shingwedsi . . .	Molotsi, Madzororo . . .	Singwedsi R.
Maila . . .	Navangwe, Mamaila . . .	Mahila's Kop.
Limvubu . . .	Lebrubye, Rebrubye, Omvobo . . .	Letsoobo, Pafuri R.
Shikundo . . .	Tshikundo, Tsukundo . . .	Chicundo Kop.
Revanga . . .	Phukane. (There are three of this name.)	
Li-Thaba . . .	Lelilaba, Lechlaba, Lethaba . . .	Letaba or Taba R.
Salatie . . .	Sanandu, Shalate . . .	Silatie or Selati R.
Lepelle . . .	Lepalule or Rembelule . . .	Olifants R.
Motyatyi . . .	Matyatye . . .	Modjadje.
Mpalaora . . .	Phala-Boroa, Palaboroa . . .	Palabora.
Libomba . . .	Lebombo, Ribombo, Longwe . . .	Rooirand.
Timperbati . . .	Timbabati, Timbati . . .	Babati R.

In the writer's opinion the safest plan would be for all cartographers of these parts to adopt the old native names, *i.e.*, the name given by the first natives living in the immediate neighbourhood, and to write these names in letters known to all nations, without any diacritical marks. New names to be given only where no native

* As an example we may quote the local names given to the trees of the district by Mr. Sawyer on p. 37 of his book. They are evidently written according to sound, but are grammatically incorrect. Mr. Alford makes similar mistakes in the names of places like Moorddrift, Haenertsburg, etc.

names exist, and then only such as are in general use, known to the whole district. Dr. Raddatz* says that a knowledge of the native language is always a good guide to the traveller, and prevents mistakes made in maps in the run of tributaries to larger rivers. Thus a want of knowledge of the native language made the Ohrigstad River a tributary of the Steelpoost (Tubatse), while its native name Molatsinoana showed that it was a tributary of the Molatsi or Blyde River, the natives being in the habit of giving tributaries the diminutive of the main river (Tubatse = Tubatsana). In his map he gives a key to the proper pronunciation of the Sesuto dialect in the German language.

Two main roads lead from Pretoria to Zoutpansberg. Of these the so-called Pan road, along the Elands River *viâ* Zebedeli's Kraal, through Strydpoort, Smitsdorp, Pietersburg to Haenertsburg and Leydsdorp, is the shorter of the two; but between Elands River and Zebedeli's water is obtainable only at one place. The distance from Pretoria to Leydsdorp by this route is 260 miles. The other route, taken by the passenger coach, leads past the Warmbath, Nylstroom, Makapanspoort, Pietpotgieters Rust, Smitsdorp, and Marabasstad to Pietersburg. The distance by this road is 280 miles. From Pietersburg the coach goes *viâ* Buffels Kraal, Dadelfontein, and the Ellerton mine to the Birthday mine, a distance of 298 miles from Pretoria, in four days' travelling. Another road leads from Pietersburg through Rhenoster Poort to the Klein Spelonken, a distance of 85 miles. The mail along this route is carried by natives. The route to Tuli Camp, Mashonaland, passes through Malitzie's location, Rieta Hill, Witklip, and Tatsani, crossing the Limpopo about 13 miles below the junction of the Macloutse. The mails are carried by comfortable passenger coaches in three days from Pietersburg to Tuli Camp, a distance of 170 miles.

Owing to the easy access and other greater attractions of the Rand goldfields, and other causes indicated above, the Zoutpansberg fields have been rather neglected; but the advent of the railway now in course of construction will greatly contribute to open up the district. Only a small portion of the district is known as yet, and that portion very superficially. Every day new discoveries are made.

NOTE.—After the map to illustrate this paper was printed, corrections were sent by the author on two tracings. The first of these has reference to the extent of the proclaimed goldfields in the neighbourhood of the sources of the Shingwedi River, the principal alteration being in the northern boundary which now runs in a direct line from Shirindi to Rebenga. The other correction has reference to a change in the boundaries of the goldfields near the sources of Melondotsi River, which, however, are not of any great importance.

* Dr. H. Raddatz, "Das Kaffernland des Unteren Olifant." *Petermanns Mittheilungen*, 1886, Heft 2.

THE STAIRS EXPEDITION TO KATANGALAND.*

By JOSEPH A. MOLONEY, L.R.C.P., Medical Officer to the Expedition.

In the spring of 1891 the Katanga Company, an international syndicate with headquarters at Brussels, signed a convention with the Congo State whereby it obtained certain preferential rights over the mines reported to be situated in the countries of Katanga and Urua, together with a third of the public domain, provided a valid occupation of these territories was effected within three years.

The work of the various expeditions of the Katanga Company has been already referred to in some little detail in these pages, and the full narrative of Captain Stairs' Expedition has been published by Dr. Moloney in his book 'With Stairs to Katanga.' The following is Dr. Moloney's address to the Society in a slightly condensed form.

The Katanga Company's expedition under the command of Captain Stairs landed at Bagamoyo on June 27th, 1891. Captain Bodson was second in command, the Marquis de Bonchamps was third, Dr. Moloney medical officer, and Thomas Robinson carpenter. The native caravan numbered three hundred and thirty-six. They marched through Mpwapwa, Tabora, the Ugunda and Ugalla countries, for some time in company with Captain Jacques' Anti-slavery Caravan, and on October 9th encamped at the French mission station, Karema, on the eastern shore of Lake Tanganyika, where, despite its advantageous position on the lake, no trace of German rule existed. From this point the journey assumed a new character, passing into scarcely-known territory, and must be described in Dr. Moloney's words.

There is a phenomenon connected with the lake which may well claim attention. From one of the Fathers we learnt the curious fact that the fort, which is now $\frac{3}{4}$ mile from the water, formerly stood at its edge. The level, it appeared, has sunk owing to the breaking down of the bar at the mouth of the Lukugu, which river drains Tanganyika from its western side. This dam forms periodically from silted sand and vegetation, causing the lake to ascend until the pressure bursts through the accumulation, when a subsidence follows. The rise and fall covers in all probability some fifteen years, and the extreme difference of level must be over 18 feet. Captain Stairs discussed this question with a very intelligent native, some fifty-five years old, who told him twice within his experience had the waters sank and once had they risen. He anticipated that they would begin to mount again in two years' time. We also ascertained that a half-knot current sets along the western shore of Tanganyika towards the mouth of the river from the north and south.

* Abstract of paper read at the Royal Geographical Society, June 5th, 1893. Reference may be made to the map of the Katanga Company's territory, Vol. I., p. 238, and to the map of British Central Africa, p. 192.

The passage of Tanganyika was accomplished in most primitive *dhows*, and the winds proving contrary, much valuable time ran to waste.

On October 31st we started for the third and final stage of our pilgrimage. A steep climb brought us to the village of Manda, situated about 5 miles from Lake Tanganyika, and some 1000 feet above its level. We were thus in the midst of the mountains which border the western side of the lake with Mrumbi as their highest peak. On November 3rd we found ourselves at a height of 5000 feet near the village of Kaomba, situated among the Makololo mountains. There is little doubt that the rocks here are peculiarly rich in minerals, and may become a source of wealth to future generations of Europeans. At Kaomba itself iron exists in considerable quantities and in a very pure condition usually as red hæmatite. Hence the village is famed for its foundries, in which hoes, axes, and spear-heads are fashioned. These edifices are built with high conical tops and contain pits about 18 feet by 6 feet, and shallower at one end than the other. The furnace is made of clay and the blast is produced by some twenty bellows composed of two parallel wooden tubes fitting into one nozzle, which is smeared with clay to resist the fire. These pipes are fitted with sticks which are held in either hand and worked up and down like pistons. The smithies are open sheds with stone anvils and hammers, the last devoid of handles. There the smelted iron is made into implements, or into masses weighing from 2 lbs. to 2½ lbs., which are carried about for sale. These lumps resemble a very fat cigar in shape, and have a small rod projecting from either end. As for the implements, they appear rude enough to the European eye; at the same time they are admirably balanced, and with a Murungu axe a native will cut, or rather dig through a thick tree-trunk with great rapidity.

A half-caste slave-dealer, Makatuba by name, the factotum of a rich Zanzibar merchant, had passed through Murungu some weeks previously, and signs of his progress were to be seen on every side in the shape of burnt and deserted villages. In one week we saw no less than six in absolute ruins. The porters were much alarmed when on November 4th we passed within a few miles of the scoundrel's permanent camp, but fortunately he considered us too strong for attack.

On the 8th we crossed the Lufuko, a river some 30 yards wide and thigh-deep, with a current of 2½ miles an hour. This stream flows into Lake Tanganyika near Mpala. In the valley were trees of hard close-grained timber which would form excellent material for the construction of canoes. Some smaller trees were covered with a round fruit about the size of a plum, whose bitter skin enclosed four triangular kernels of a peculiarly sweet flavour. Here the mountains end, and with them Murungu, for the adjacent district, though assigned to Murungu in the maps, should really be called Kipemba. We crossed a low range of hills near the village of Makaweke and arrived at the Ludifwa, a rapid

stream some 18 yards broad, which runs into the Lufunso and so into the Lualaba.

This country is very fine, and suitable alike to pasturage or agriculture. It is covered in parts with tropical forests in which the creepers and ferns reminded Captain Stairs of the Aruwimi uplands traversed by the Emin Relief Expedition. Some of the first marches were through swamps, and the vegetation consisted chiefly of dwarf bamboo, though the more open spaces were covered with herbage and flowers. But we soon entered upon an undulating prairie-land, in which the highlands could pasture any amount of cattle, while the valleys, with their thick beds of vegetable mould, would grow rice and the vegetables produced by the natives, such as manioc, maize, and matamah. Irrigation would be unnecessary, since the plateau is traversed by streams of clear water which, according to the natives, remain unexhausted in the dry season. From its altitude, some 4200 feet above the sea-level, it should be habitable by a European population. The rainy season is said to last five months.

Makatuba had visited this district also, and in consequence, for five days we did not pass a single inhabited village. On the 8th, however, we came across a retired colony which had escaped the scoundrel's raids. The people were a fine and intelligent-looking race, and though the men smeared their heads with a noxious concoction of red clay and grease, the women dressed their heads very becomingly with beads of various colours. They are great hunters, and organise large drives in which the game, which includes elephants, is urged towards some twenty pits dug in a pathway about a quarter of a mile long, let us say, by 20 feet wide.

On the 12th we descended upon the Lufunso, a tributary of the Lualaba. The current runs very fast and the water is waist-deep and 30 yards wide. A rope was thrown across, and the passage was effected without mishap. That night we encamped on the banks of the Lualaba in latitude $8^{\circ} 9' 44''$ S. and longitude $29^{\circ} 6' 45''$ E., and about 15 miles or two short marches north of Lake Moero. Here we remained until the 19th, so as to give our messengers time to reach Msiri with a letter from Captain Stairs. During this interval Captain Stairs succeeded in settling a long standing quarrel between Ngwena, a chief who dwells upon an island in the river, and his powerful neighbour Mpweto, who hails from the north of Lake Moero. After a most protracted *shauri* the dispute, which originated in the theft of a goat, was composed, and next day both potentates accepted the Belgian flag. We were able to ascertain some important facts about the Lualaba, partly by soundings, and partly from information acquired from two intelligent Arabs, Kafindo and Uturutu. The first impression, that of a volume of deep water, proved to be an entire misconception. The river is very wide, its breadth varying from half

a mile to a mile, but, though 30 feet deep in parts, sharp dentated rocks were to be found within a few feet of the surface. In fact, we were told that an experienced native could cross without getting wet above the waist. In no place did the Lualaba appear navigable except for canoes of the shallowest draught. We discovered a low cascade about 5 miles up-stream, and $2\frac{1}{2}$ miles further on the channel became impeded by numerous wooded islands, beyond which were rapids quite three quarters of a mile wide. The natives told us that only one opening was navigable except in January, and I may mention that the rise during the rainy season is very slight compared with most African rivers. This appears the more remarkable because in Kipemba and Murungu, which drains into the Lualaba, it rains for five months in the year, and so great is the downpour that the natives can only grow one harvest.

As to the subsequent course of the river we learnt from Kafindo that for seven long marches it tumbles northward in a succession of rapids varied by two considerable cataracts. This statement can easily be credited, when one remembers that at Ngwena's the stream was 2800 feet above the sea-level, and that at Nyangwe, where Commander Cameron crossed, it is only 2300 feet. The distance between the two places is about 400 miles, so that the drop must be over 13 inches to the mile. The Arabs reported that fifteen marches or some 120 miles to the north-north-west of Ngwena's the river joins Msiri's Lualaba, otherwise known as the Kamalundo, and that the united stream, yet five marches (40 miles) further on meets the Lukugu, flowing from Lake Tanganyika. This information has been confirmed by M. Delcommune's expedition. Having effected the passage of the Lualaba in our steel boats and some canoes supplied by Ngwena, we ascended a spur of the Urua Mountain 570 feet high. The topmost peaks rose some 850 feet above our heads, and were covered with trees. Great quantities of buffalo frequented the lower slopes, and a cow and her calf put the whole expedition to rout by an unexpected charge. On the 22nd and 23rd we marched along the Luvule, which river joins the Lualaba, between Ngwena's and Mpweto's. Thence we diverged into the valleys or oozes of which Livingstone speaks, and on one of them known as the plain of Chewella we had some excellent sport with buffalo and Vardon's antelope. I observe that on some of the Belgian maps the depression is coloured as if it were a lake; but though it becomes, as we had subsequent reason to know, a pestiferous swamp in winter, we walked in November upon smiling meadow-land.

The Luvule was crossed on November 27th at Kifambula's village, and we ascended a mountain range separating the eastern and western water-systems of the two Lualabas. Its altitude is some 4000 feet, and the Valley of Gera to the west has a rich black soil, in which sugar-cane and rice would flourish, as also the plain of Kissinga near the sources of

the Luvule. We heard, however, that to the south-west there is little water to be found in the dry season. Keeping along the bottom of this trough, so to speak, we passed through scattered forest varied by rivers. The Mpango, Luiki, and Luizi are tributaries of the Luvua, which runs into the Lufira, which is a tributary of the Kamalundo or Western Lualaba. Away to the south-east lies the mighty plateau of Konde Rungo, rising some 2700 feet above the plains of the Luvua and Lufira, and stretching to lat. $11^{\circ} 20' S$.

The Luvua itself we traversed near Kifuntwe's by means of a wooden bridge, and two days afterwards (on December 9th) we struck the stream again at the point of its junction with the Lufira 2952 feet above the sea-level. This last is a river some 40 feet deep, about 45 yards wide, and with a current of 2 miles an hour. It has cut a channel about 30 feet below the surface of the plain, over which it describes the most capricious meanderings. We descended the red clay banks and put together the boats for crossing that day. This was our last passage, as we only marched along the banks of the Lukulwé, which joins the Lufira on its right bank. Like the main stream, it has dug a deep bed in the surrounding plain, and is quite 35 feet deep, and swarming with crocodiles.

As we drew near Msiri's it became evident that famine stared us in the face. Fortunately game abounded so that the porters were not absolutely destitute of food. Still on an occasion they went hungry for eight-and-forty hours, and in addition violent thunderstorms, accompanied by fearful gales of wind, used to put out the fires night after night. And yet the soil seemed fertile enough, while large fields, planted with Indian corn, mhoga, and viazi testified to the natives' industry. The scarcity was due to plundering by Msiri's warriors. Everywhere we were hailed as deliverers, and in no case did Captain Stairs encounter the smallest reluctance to accept the Congo flag. Many of the smaller villages were absolutely deserted, and even the important chief Kifambula had been compelled to shift his homestead.

On December 14th we encamped within a mile of Bunkeia, Msiri's capital. Our journey from Bagamoyo had taken five months and ten days, during which we had made one hundred and twenty marches averaging 9 miles each. This we believed to be a "record" performance in African travel; but the situation with which Captain Stairs had to deal can only be described as desperate. Clearly the empire which the Wanyamwesi adventurer had founded some thirty years before was fast crumbling to pieces. Msiri's authority was practically confined to the valley, some 14 miles square, in which Bunkeia stands, and the approaches to the capital were absolutely denuded of live stock, while the fields remained uncultivated.

Hence Captain Stairs had to make quick work; more especially as we were daily expecting the [arrival of the] South African Company's

Expedition under Mr. Joseph Thomson. At the same time he was hampered by the presence of three English missionaries, Messrs. Crauford, Lane, and Thompson, with whom it would have gone hard in case of hostilities. However, they were soon out of harm's way in the fort built by the Belgian officer, M. Legat, upon the Lifoi some 20 miles away. After two unfruitful palavers with Msiri, Captain Stairs took the law into his own hands and hoisted the Belgian flag upon the hill behind Bunkeia. The king, however, declined to make "blood brotherhood," and escaped by night to a large village called Munema, about 3 miles away. Captain Bodson and the Marquis de Bonchamps were despatched to take him prisoner, whereupon a fracas ensued in which Captain Bodson shot Msiri in self-defence, but was himself killed by one of the king's slaves. The natives fled, and the Zanzibaris promptly began to loot the place, though after some difficulty we restored order and effected a safe retreat. Next day Captain Stairs marched to a large deserted village about 2 miles to the south of Bunkeia and built a fort, without molestation from the inhabitants. Msiri's adopted son, Makanda Vanta, was recognised as his heir, and received as his portion the Bunkeia Valley, while his uncles Lukuku and Chikako were assigned small subchieftainships comprising their respective villages and the appurtenant fields. Then the Wasanga came in, and with them, Captain Stairs being very ill, I made fifteen treaties, and the Belgian authority was acknowledged within a radius of 50 miles from Bunkeia. From one of these chiefs, Mutwila by name, I learnt that a rich vein of gold was to be seen close to his village, about four days march to the south of Bunkeia.

On Christmas Day our porters were given a holiday, and after scouring the country-side, returned with the news that not a mouthful of food was to be obtained within a day's march. Accordingly the camp had to exist for the next three weeks upon leaves and grass, varied by fried locusts and ants. It should be remembered also that the rainy season was fairly upon us and that the rain descended in torrents for five or six hours a day. Hence, fever combined with hunger began to play havoc, and the men died at the rate of two per diem. In all we buried seventy-three, and with desertion the caravan was reduced from three hundred and sixty to two hundred. As for the Europeans, the Marquis de Bonchamps was very ill with fever, and both Captain Stairs and Robinson lay at death's door from hæmaturia and other complications. I alone kept on my legs, and an anxious time it was.

On January 24th, 1892, some Indian corn, which the natives had planted before Msiri drove them forth in the previous November, became ripe enough to be eaten, and therewith our prospects began to improve; also Captain Bia's caravan reached Bunkeia on the 30th.

After consulting with Captain Bia, Captain Stairs decided to hand

over the fort to the Belgians and to return to the coast through English territory. Accordingly we turned our backs upon the familiar *boma* on February 4th, and Lieutenant Franqui took over the station.

We pursued our old route as far as Kifambula's, but under very different circumstances. The rains had entirely altered the face of the country, and what had before been pleasant meadow-land was now a pestiferous and icy cold swamp, through which the porters had to wade while the burning sun beat upon their heads. In consequence the men, who had barely recovered from starvation, fell sick by the score, and some actually died from exposure. After straggling along the road in very disorderly fashion—for all the white men were down with fever—we left our former road on March 5th and made for Lake Moero across the Konde Rungo plateau. We hit the lake on the 15th near a large village owned by Chipula, Mpweto's brother, and crossed the Lualaba a short distance above its egress from Moero. The river, I may mention, runs due west for about 200 yards, then takes a sharp curve to the south-west, and must effect further bends before reaching Ngwena's, where it flows due north. Mr. Alfred Sharpe has described this part of Africa so recently and so well that I feel exempt from commenting upon its aspects, though we were unable to discover that the sheet of water which he terms the old Lake Moero was anything more than a swamp.

The journey from Tanganyika along the Stevenson Road to Nyasa and down the latter lake to the Shiré, and so, with the passage overland necessitated by the Murchison rapids, into the Zambesi, is familiar. On June 3rd we arrived at the Portuguese port of Vicenti, whose importance has departed with the silting up of the Qua-Qua mouth. There poor Captain Stairs was seized with an attack of hæmaturia in its gravest form, and, though we reached Chinde on the seaboard on June 4th, he expired there on the 9th. Throughout the march to the coast he had gradually been regaining strength, and by the time we reached Nyasa he was practically convalescent. Indeed he proposed, on reaching Zanzibar, to go at once to the assistance of Captain Jacques at Albertville or of Captain Lugard in Uganda. But the fever-belt did its work upon his enfeebled frame, and we buried him on the very day that the S.S. *Roruma* arrived to take us home. It was a sad end to an expedition which he had conducted with such a signal combination of courage and caution.

Before the reading of the paper, General STRACHEY, who occupied the chair, said: The paper that will be read to you this evening describes the results of the expedition carried through the country at the head of the most southern affluents of the Congo, known as the Lualaba and Luapula, which lie between 7° and 11° N. lat, about 200 or 300 miles to the west of the southern extremity of Tanganyika. This country forms the south-east angle of the territories of the Congo Free State. The expedition was carried out in connection with the operations of the administration of that State. The country had already been

visited by several other travellers, and there is an account of a journey by Mr. Sharpe, who approached it from the east, to be found in the *Proceedings* of the Society for January 1892. I might also remind you that Mr. Arnott has been established in this region for some years as a missionary. He entered the country for the first time in 1886, and in 1889 returned to England and received the Murchison and Cuthbert-Peek awards from the Society; you may also remember that he was entrusted with the Livingstone memorial-tablet which has recently been fixed on the tree under which that great traveller died. I will now leave you to listen to Dr. Moloney's interesting account of his journey.

After the reading of the Paper, the following discussion took place:—

Commander LOVETT CAMERON: As a representative in England of the Katanga Company, which sent out the expedition commanded by Captain Stairs, and which has been so worthily represented here by Dr. Moloney to-night, while adding my testimony to what was done by Captain Stairs, I may say that lately, when at Lisbon, I had the pleasure of welcoming the expeditions of MM. Delcommune and Franqui, and was informed that, from the very commencement, after the first illness of Captain Stairs, the backbone of the expedition had been Dr. Moloney. While all the other whites had to be carried along in hammocks he brought up the rear of the caravan. He it was who went under fire to bring away Captain Bodson, and tended him until he died. Dr. Moloney made all the treaties, and when Captain Bia arrived turned over the fort to him; and it was Dr. Moloney who took the dying men away to Tanganyika. I had the pleasure of meeting Dr. Moloney at Marseilles on his arrival, and am sure no one can bear greater testimony as to what he did than the members of the Belgian expeditions who followed him and to some extent preceded him in Africa. I wish also to be allowed to say a few words as to the geography. With regard to the much-vexed question of the Lukuga, the expedition simply confirms every word I said from the beginning, *i.e.*, since I discovered it was the outlet of the Tanganyika. The fiction of the Tanganyika being gradually filled up has been exploded; as I wrote, the tingy-tingy blocked the exit of the Tanganyika by the Lukuga, allowing very little water to pass through, and in consequence the level of the lake varied very much—the lake may be partially blocked for a time, but there is always the exit. In another thing I am inclined to differ geographically with Dr. Moloney; he places Tabora in the Congo basin; I am inclined to place it, from my own observations, in the Nile basin; the parting lies a few miles to the south-west of Tabora when you come to the towns of Ugunda. The West Lualaba has been pointed to instead of that from Lake Moero. This might have given you an idea that the Western Lualaba was constantly interrupted by rapids, whereas from Delcommune's expedition we know that from Nyangwe the river is practically open to unimpeded navigation as far as Kassali. Again, I object to the position of the south end of Tanganyika. The south end was at first visited by Livingstone, and he believed, owing to a mistake Speke had made in his levels, due to imperfect instruments, that it was a separate lake. When I completed my survey of the south end of the lake my longitude was precisely the same as Livingstone's; and when I returned, in 1876, my observations were submitted to Greenwich, and no one said anything against them. In all other parts of my work my observations have been proved to be right by subsequent travellers; but for some reason or another the south end of the lake has been moved considerably to the west of its true position. The map shows the distance as 250 miles; now Dr. Moloney, though he travelled fast and hurriedly for a part of the way, could not have marched that distance in the time he

took, however hurriedly he may have pressed ahead; the average time occupied between the two lakes by caravans is thirteen days, and as 10 geographical miles is an exceedingly good daily average for a caravan, this would give the distance as 130 geographical miles, or nearly precisely the distance laid down in my maps nearly twenty years ago. The Belgians also assure me that my position is correct. I trust that in future maps of the Society the south end of Lake Tanganyika will be put in its proper position.

Mr. DELMAR MORGAN: As an old officer of the Belgian International Association, afterwards the Free State of the Congo, I should like to say a few words. In 1883, when I went out to Africa, they had only gone about 400 miles from the coast. Now they have ascended nearly to the sources of the Congo. Of the officers mentioned by Dr. Moloney in the service of the Congo Free State, M. Delcommune had just arrived and been placed at the head of the commercial expedition which he afterwards led with such distinction. There was also M. Van den Kerckhoven, of whose death we learned not long ago, while in command of an expedition to the White Nile, and I am at a loss to understand why such ungenerous reports were spread concerning him. I travelled with him from Stanley Pool to Vivi, and found him in every way a most pleasant companion and a good officer, thoroughly zealous and anxious to do his best for the work of regenerating Africa. I cannot help adding my testimony to that of Dr. Moloney when he spoke of the gallant conduct of some of the Belgian officers employed in that part of Africa. The way they have laid down their lives in the service of the Congo State and the efforts they have made to promote civilisation are worthy of every praise. While the King of the Belgians has, as we all know, been making great efforts to extend the benefits of freedom and commerce to Africa, it strikes me as remarkable that in the regions of Eastern Africa, under the influence of two great European powers, these slave caravans carrying rifles and gunpowder should still be tolerated. It seems to me that if Germany and England were at once to take adequate measures the Arab slave-trade would be a thing of the past, instead of causing, as it does now, the depopulation of these beautiful districts.

Lieutenant B. L. SCLATER, R.E.: The late Captain Stairs was a much-valued friend and comrade of mine, and I have listened to Dr. Moloney's account of his last expedition with great interest. In June 1891 I had the pleasure of travelling along with Stairs and his expedition as far as Zanzibar. Again I met him at Blantyre on his return from Katanga in 1892. In spite of his weak state of health, and against the advice of Dr. Moloney, Stairs, who had suffered from a severe attack of fever at Katanga, was so anxious to get home and report on the work with which he had been entrusted, that he refused to delay a little at Blantyre in order to recover his strength, and pushed on at once down the Zambesi valley. Here he was seized by the relapse, which ended so fatally at Chinde, and thus was lost to Africa one, who, had he lived, would undoubtedly have proved himself eminently worthy to be classed among the greatest explorers of that continent. On the voyage out to Zanzibar Stairs expressed his regret to me that he was unable to use the Zambesi route on his way to Tanganyika, because Mr. Johnston had engaged all the available transport on the Zambesi for his passage to Nyasaland. Dr. Moloney's account of Stairs' expedition shows still more clearly the great advantages of the Zambesi-Nyasa route for reaching the heart of Central Africa. Whereas Stairs with a fresh and well-equipped caravan took twelve weeks to reach Lake Tanganyika by the overland route from Zanzibar, his return journey from that lake to the coast took him less than six. Again, Mr. Alfred Sharpe, Vice-Consul at Blantyre, has recently travelled from Abercorn, at the south end of Lake Tanganyika to Blantyre in twenty-eight days, of which the land journey only occupied fourteen

days, while from Blantyre to the coast I have lately made the journey in six days, and even the passage up-stream can generally be performed in from ten to twelve days. Another great advantage of this route is that in Blantyre there is a civilised and well-supplied depot 200 miles in the interior. Mr. Sharpe, when fitting out his last expedition to Moero, was able to collect from the various stores in Blantyre all the outfit, provisions and trade goods required for the six months' journey, of which he has given an account in *The Geographical Journal* for June 1893. Since Mr. Johnston assumed the administration of Nyasaland in 1891 the freedom of the Zambesi River has, through his exertions, become an accomplished fact. Goods can now be shipped from Chinde direct to British territory without any of the restrictions and duties which were formerly imposed on the Quilimane route, and which were at first attempted to be enforced at the Chinde mouth. A well-graded cart-road from Chikwawa, on the Lower Shire, to Mpimbi, on the Upper Shire, is now almost completed, and the old road made by the African Lakes Company has been improved and altered in places where it was too steep for wheeled traffic. On Lake Nyasa there are three steamers already running, and the two gunboats for the lake and a paddle-steamer for the Upper Shire are now being put together by Captain Robertson, R.N. at Mpimbi. A letter received last week from Mr. Sharpe informs me that all the parts of these gunboats are already at Mpimbi, and that the boats will probably be launched in July next, or at the latest by the beginning of August. Major Wissmann's gunboat is also in process of construction at Mpimbi, and will probably be launched before the end of this year. Mr. Crawshaw has lately been sent to Karonga at the north end of the lake, to organise the surrounding district, and when the new gunboats are on the lake, there will be no need to fear the Arab power, which at one time threatened this station. The Stevenson road from Karonga to Abercorn on Lake Tanganyika is only 220 miles in length, and caravans have been passing constantly along it for the last four years without interruption. There is always an ample supply of native porters at Karonga for the conveyance of goods along the road. The Stairs expedition and the recent journeys of Mr. Sharpe, of M. Delcommune, and of Captain Bia, have shown how easily the upper waters of the Congo and Lakes Moero and Bangweolo may be reached from Lake Tanganyika. Starting again from the north end of Tanganyika the transit of 160 miles to Victoria Nyanza, as lately shown by Dr. Baumann (see *Geographical Journal*, March, 1893), should be accomplished in a fortnight. Thus the whole journey from the coast to Uganda by this route would not take more than from ten to twelve weeks, of which only about four weeks are on land, the rest being performed in steamers. This is obviously an enormous advantage in comparison with the long and continuous overland journey from Mombasa of from three to four months. I would also point out that whereas the former monthly overland mail from Zanzibar to Ujiji has been stopped for the last five years, the mail-service by the Nyasa route is now thoroughly organised. Mails are delivered at Abercorn every month or six weeks for all the stations on Tanganyika, including those in the Congo Free State and German territories. Stairs informed me that the only letters he received during his stay in Katanga arrived by this route, and not by the Congo. I thus think that Stairs' journey has, in addition to its other remarkable incidents, materially helped to prove the great advantages which the Zambesi-Nyasa route has to offer over the long land-journeys required to reach the Central African lakes, either from Zanzibar or from Mombasa. These advantages will be still further increased when the steam-tram, which we may look forward to, shall supersede the portage up the Shire rapids and the Stevenson road, and when Mr. Rhodes's telegraph from Fort Salisbury to Uganda, the construction of which is already commenced, shall have been completed.

Mr. STEPHENSON : After what Mr. Bertram Slater has told you I think there is little to say as to the advantages of this route. I think a glance at the map proves that this is the way to open up East-central Africa. As a member of Mr. Johnston's administration I think I can safely say he has done a great deal to pacify the country. He has had several rows with the slavers, and we may safely say he has dealt several blows at the slave trade. It is matter for much regret that gallant Captain Maguire lost his life during an attack on Makanjila's. Soon after his arrival Captain Maguire had to go into action against a slaving chief. Some months afterwards he was shot in the breast, and the shot glanced along his ribs ; it was characteristic of the man that he was the last to go to the doctor, allowing all the Sikhs and Zanzibaris to go first. Mr. Johnston will, I suppose, be home in eighteen months, and he will then be able to tell you of his work better than I can. He has already run several risks, and only a few months ago, in the course of a skirmish with the Arabs, a bullet went between him and the man he was talking to, hitting somebody behind him.

General STRACHEY : At this late hour it only remains for me to ask you to return thanks to Dr. Moloney for the extremely interesting account he has given of his journey, and likewise to the gentlemen who are associated with Mr. Johnston in the South-eastern part of Central Africa for what they have told us of the progress that has been made in the civilisation of these districts. We shall be very glad, I am sure, to hear, when Mr. Johnston comes back, the accounts that he is quite certain to be willing to give of the results of his adventurous administration.

PORTUGUESE EAST INDIA RECORDS.*

IN 1891 and 1892, Mr. Danvers made two visits to Portugal for the purpose of inspecting the Records at Lisbon and Evora relating to the early Portuguese possessions in the East Indies. In his report to the Secretary of State, he briefly describes the collections of documents which deal chiefly with Indian affairs, and gives extracts from those of most interest, where necessary supplementing them from already published material so as to form a more or less continuous narrative. Thus, while the report will be useful as a guide to those who have the opportunity of consulting the Records themselves—of which some have been published at Lisbon, and Mr. Danvers was thus able to procure copies—it also in itself throws much light on the details of Portuguese history in the East. The quotations from the letters of successive Viceroy's to the Sovereign, and from the collections of treaties (both with European powers and Eastern potentates), are of special interest.

The early position of the History is dealt with briefly, since of this, pretty full accounts already exist in the histories of De Barros, Castanheda, and other Portuguese writers, some of which are accessible

* Réport to the Secretary of State on the Records relating to the East Indies, contained in the *Torre do Tombo*, and the Libraries at Lisbon and Evora. By F. C. Danvers, Superintendent of Records, India Office, London ; 1892.

to English readers, *e.g.*, the 'Voyages of Vasco da Gama,' and the 'Commentaries of Albuquerque,' published by the Hakluyt Society. The period of the decadence of the Portuguese power is treated more fully, and the documents quoted enable us to trace the gradual progress of this decline, as well as the efforts made to arrest the same by futile expedients for stimulating trade. Repeated mention is made of the ruinous state of the public finances at the beginning of the seventeenth century, and to the extensive misappropriation of funds which seems to have prevailed. The intense rivalry between the several European nations is fully illustrated, and many instances are given of the high-handed proceedings to which it gave rise, especially on the part of the Dutch. Hostilities were incessant between the latter and the Portuguese, while these maintained, as a rule, better relations with the English, though still regarding them with great jealousy. The despatches which are reproduced on the subject of the cession of Bombay to the English are interesting, as showing that the Portuguese authorities on the spot fully realised the importance of the position, and the blow which its loss would deal to their power. The contract having however been already signed in Europe, the protests of the Portuguese Viceroy were unavailing.

The bad effect on colonial affairs of the union of the Spanish and Portuguese monarchies is exemplified by the fact, noticed by Mr. Danvers, that in the endeavour to keep the interests of the two States distinct trade was actually forbidden between the Portuguese Settlement at Macao and the Spanish Possessions in the Philippines. This prohibition seems to have been maintained even when the growing power of the Dutch in the Eastern seas, and their machinations against the Portuguese in Japan, threatened the entire ruin of Macao. The extent to which Portuguese trade was hampered by the Dutch may be gathered from the fact that one year, through want of ships and for greater security for the cargo, the Viceroy of Goa was driven to charter an English vessel to carry on the trade with China.

Many extracts are given relating to the long struggle between the Portuguese and the Mahrattas and other native chiefs of the territories adjoining those of the Portuguese in Western India, which resulted in the loss of most of the ports which had been maintained against the Dutch. The report also deals separately with the contests of the Portuguese in the Persian Gulf, firstly with the Persians and afterwards with the Turks and Arabs; their occupation of Ceylon and ejection by the Dutch, and their settlements in the Archipelago and in China. For these last the accounts contained in the records are more meagre, though some important documents are referred to touching the disputed sovereignty over the Moluccas, which throw light on the first voyages of the Portuguese to those islands after the capture of Malacca by Albuquerque in 1511. The despatches of that commander show the

importance of the latter town as an emporium of commerce, before it had been ruined by the incessant attacks made on the Portuguese there, both by the Dutch and by neighbouring native princes; thus confirming the accounts of Varthema and other travellers of that period. With regard to the Dutch attacks on Malacca it may be noticed that none seems to be mentioned of so early a date as that which Gabriel Towerson describes in a letter published in the Hakluyt Society's edition of Sir H. Middleton's voyage.

The details of the rapid rise of the Portuguese power in the far East, and of its no less rapid decline, are by no means widely known; and this report will undoubtedly be of service to those inclined to carry on researches in this interesting field of enquiry.

A TRIP TO HARAR AND IMÉ.

By Captain H. G. C. SWAYNE, R.E.*

CAPTAIN SWAYNE, who has been on a sporting expedition in Somali-land, writes from Aden:—I started from Bulhar on February 16th, and went to Jig-Jiga, where I found an Abyssinian guard of twenty men posted in their stockaded fort over the wells. I had twenty-five Somalis, all told. Next day, an Abyssinian chief called Banagusé Fi Taurari marched into the stockade from Gojai, about 20 miles to the west, accompanied by about three hundred and fifty horse and foot, to resist the supposed invader, the Somalis having exaggerated my trip into a British invasion. Nearly all the Abyssinians carried good Remingtons. Banagusé seemed inclined at first to arrest me, but on hearing I had come up in order to visit Ras Makuwan, the Harar governor, he was afraid to do so. I sent a letter to Makuwan, and after I had waited at Jig-Jiga a few days, one Gakatagli came with a very polite note from the Ras, asking me to come to Harar.

On nearing Harar I found I had to pass through two lines of soldiers, to the number of about a thousand, brought out to escort me, by order of the Ras, who is very hospitably inclined to the English. Each company presented arms as I passed along the path between the lines. I remained at Harar five days, a guest at the house of Alaka Gobau Desta; and before leaving I gave the Ras an Indian tiger-skin and an album of Indian photographs; receiving in return his photograph, a silver-mounted shield, spears, saddlery, and a good mule, also a passport ordering any soldiers whom I might encounter in Ogaden to treat me courteously. I also received much kindness from Count Salimbeni and the Europeans at Harar.

* Captain Swayne's route will be indicated upon a sketch-map illustrating Signor Bricchetti-Robecchi's 'Travels in the Somali Country,' in the October number.

Returning to Jig-Jiga, I made my way to Kuredelli, in the Jerer Valley, and began shooting from that place, getting a lioness and rhinoceros one night over the water. I went on down the Jerer Valley, getting two more rhinoceroses at Tulli, and a panther. Leaving Milmil three days to the east, I turned at right angles, and marched to Dagaha-madoba, getting another panther. Thence I went to Segag, one of Captain Baudi's camps, he having gone to Imé some three years ago. Near Segag, in a valley called Daghatto, I shot a bull elephant. I went on through the Malingur tribe, and after some difficulty opened up communication with the Rer Amaden tribe. Jama Deria, a minstrel, or bard, known all over Somaliland, was very polite, and advised me, if I wished to go to Imé, to leave my caravan with him at Dambas Werer, while he would lend me five ponies and the services of his son and two headmen, and we should all ride to Imé together.

With Jama Deria, his son, and two others, and three of my own men, on two Arab fast camels, one mule, and five ponies, I went to Imé and back within six days (150 miles), during nearly four of which I remained at Imé the guest of the Adone chief, Gabba Oboho, and hunted the "balanka," or waterbuck. On approaching Imé, I found the negro (Adone) inhabitants collected on the hills across the river, having deserted their huts, fearing our small cavalcade was the reconnoitring advance-guard of an Abyssinian force. The Imé people were all calling themselves British "subjects." In fact everybody except the Malingur Agaden did so. The Malingur living in the Tug Fafan Valley are in the great eastward path of invasion by the Abyssinians, hence they have had to give in to them. But the Rer Amaden have inflicted great loss on the Abyssinians from time to time. I saw the remains of the bivouac of an enormous Abyssinian army which had been defeated some two or three years before. The forest fringing the Webbe, for 100 yards on either side, is very fine at Imé, consisting chiefly of tall casuarinas and evergreens. The river is about 100 yards wide or so. Waterbuck were very common. There had been war between the Amaden and the Imé, Adone, and Somalis of Karaulé, so the country between Dambas Werer and Imé was quite empty. The Arussi Gallas, who live to the south-west, from Segag to Imé, are the great bugbear, as they raid the Somalis occasionally all along that line of country. Old Gabba promised to take me to the Gure Gallas, to the south-east of Imé, where there are said to be buffaloes and giraffes. They have a good road to Logh above Bardera, on the Jub or Webbe Ganana. Gabba said when I was there (in May), "Come in two months' time, when you can ford the Webbe with your camels."

Finding my leave nearly at an end, I returned as fast as possible by the way I had come, halting only once for a day at Jama Deria's own karias. At Durhi I was so unfortunate as to lose one of my best men, carried off by a man-eating lion while riding alone in the jungle. I

shot a lion near Segag, and a large number of the zebras which have, I believe, lately been classified as "Grevy's zebras." Their meat forms a favourite article of food among the Rer Amaden. My followers were unfortunate on this trip; one man had his leg broken by the fall of a camel, another quarrelled with an Abyssinian and got a spear through the hand, and a third was badly scratched by a panther which we were following at night. I lost eight camels out of the thirty, owing to the rapid marching and the bad state in which I found them before starting. The Somalis also consider that two died solely from the bite of the "balaad" fly of Ogaden, specimens of which I secured. The "dug" is another bad fly, but not so deadly as the balaad.

I returned by Milmil and the Habr Gerhaji's country. At Aden I found I had received six months' extension of leave, and I return tomorrow to Berbera and start for Imé afresh, with the object of doing a good private survey if possible in the country of the Gure Gallas beyond Imé; though of course my main reason for these journeys is to open up new shooting grounds. My followers place all the difficulties they can in my way, because they are afraid of the Galla country, but I am taking two interpreters who are Gallas themselves. I shall take forty rifles to Imé, and engage also Galla and Adone followers up there.

THE PHYSICAL GEOGRAPHY OF ANTARCTICA.

If the most certain method of stimulating research in a special subject is to set forth the total inadequacy of present knowledge, to answer questions raised in the setting of it, Dr. Karl Fricker's exhaustive if somewhat diffuse paper on "Die Entstehung und Verbreitung des Antarktischen Treibeises" should be to scientific explorers as grapes from an Antarctic Eschol. The contributions of Payer in Franz Josef Land and of Nansen in Greenland to our knowledge of the structure and motion of Arctic glaciers, as distinguished from Alpine or strictly valley glaciers, have thrown new light on the work of the few navigators who have as yet crossed the Antarctic circle, and a review of the subject from the more recent standpoint is excellent preparation for further personal inquiry.

The occurrence of drift-ice in the southern seas, although observed at an early date, is not a frequent entry in ships' log-books until near the end of the seventeenth century; the rediscovery of Le Maire Strait in 1616 having gradually led bolder navigators to forsake the, up to that time, invariable passage of the Straits of Magellan. Land had been discovered on the first attempt to reach higher southern latitudes by Amerigo Vespucci, who in 1502 found uninhabited land somewhere near the parallel of 50° S. Considerable doubt remains as to the identity of the land mentioned by Vespucci, uncertainty as to certain passages in his journal, and inherent errors in the determination of positions, leaving the choice of the east coast of Patagonia, the Falkland Islands, and South Georgia. Dr. Fricker inclines to select the last. Drake's Antarctic explorations seem distinctly apocryphal, and the next visitor to those parts was the Dutch pirate, Dirk Gerritz, who in 1599 was driven south from the Straits of Magellan by a severe gale, probably as far as 64° S.

After the discovery of Le Maire Strait several more or less doubtful discoveries appear in the records of the 'Nassau Fleet' under Jakob L'Heremite, of Hendrik Brouwe, Abel Tasman, and Antonio de la Roché; but the first explicit statement comes in 1681 from Captain Barthelemy Sharp, who, while on his way to pillage Spanish possessions on the west coast of America, found himself on November 14th in lat. $57^{\circ} 50'$ S., somewhat east of the meridian of Cape Horn, and reports that "On this day we could perceive land, from which at noon we were due west." This Dr. Fricker takes to have been ice, which Sharp actually encountered three days later in $58^{\circ} 30'$ S., drifting before a southerly current. In February, 1684, the *Revenge*, with William Dampier, Edward Davis, Lionel Wafer, Ambrose Cowley and John Cook on board, reached lat. $60^{\circ} 31'$ S., somewhat westward of Cape Horn, without encountering ice; but on her return voyage in 1687 large numbers of icebergs were sighted in the Atlantic in lat. $62^{\circ} 45'$. Halley's second expedition, in 1700, cut the fiftieth parallel in 45° W. longitude, but no mention is made of drift-ice.

The first part of the eighteenth century shows a much larger number of vessels in the southern latitudes, chiefly French; and in particular the special expedition sent out under the command of Lozier Bouvet in 1738 to rediscover the "southlands" of Binot Paulmier de Gonneville (1504). After much suffering from fog, Bouvet sighted three large icebergs in lat. 49° S., and obtained therefrom much encouragement by the remarkable conclusion that because they were high they came from high land, and high lands being healthy he must be on the way to countries either already well populated or eminently adopted for colonisation. Bouvet's Island, sighted on January 1st, 1739, scarcely justified his expectations. The discovery of South Georgia by the Spanish ship *Leon* in June, 1756, closes the list of the early explorers; and Cook's Antarctic voyage in 1775 begins the more familiar achievements of modern days.

The sources of polar ice are in the main three—snow or glacier ice, fresh-water ice, and sea-water ice, with the possible addition of a fourth, the coast ice or ice foot—and, inasmuch as the relative importance of these is determined both directly and indirectly through the influence on climate, by the geographical distribution of land and sea, the south polar regions present, so far at least as is known, an almost complete contrast to the north. The northern hemisphere has a polar sea, enclosed by a polar continent except for at the most four or five openings, of which only two—Davis Strait and the channel between Iceland and Norway—are of real moment in the movement or distribution of ice, while the southern hemisphere has a polar continent surrounded by a polar ocean, to which a number of islands contribute a quite negligible fraction of the total ice. The supposed Antarctic continent has been touched by explorers in three distinct regions—Enderby Land and Kemp Land in 40° to 60° E. longitude, Wilkes Land and Victoria Land 100° to 170° E. longitude, and Graham Land and Alexander I. Land, with a number of detached islands (for which Dr. Fricker proposes the name Gerritsz Archipelago) to the south of Cape Horn—and in each case it has been found to present an almost unbroken sheet of ice, varying in thickness and formation with the configuration of the land, which extends outwards from the coast and terminates in precipitous ice-cliffs, the great ice barrier.

The conditions giving rise to the formation of an ice-cap of such dimensions are chiefly, of course, those of climate, and of these our knowledge is as yet woefully meagre. Theory, as at present developed, requires a polar area of low barometric pressure—a uniform gradient downwards from all sides—and a belt of westerly winds with a central calm area; and for comment we have only a few sets of observations taken during the summer months, none of which extend over more than a few weeks in one place. But so far as they go the observations almost directly traverse the theoretical hypotheses. They indicate in the first place a zone

of low pressure in about 75° S. latitude, with higher barometer further south. Hann suggests that this trough is due to the passage of moving cyclones; but the supposition is not borne out by the wind observations, which show an overwhelming majority in favour of points between S. and N.E. Since the air temperature over the continent cannot even in summer much exceed the freezing-point on account of the ice covering, it seems not unreasonable to suppose as an alternative that pressure continues to increase with latitude after the 75th parallel, and that the southerly and easterly winds are the overflowing currents from a permanent polar anti-cyclone. It was to be expected *à priori* that a theory founded on the assumption of a homogeneous land or sea surface would require modification in the circumstances, and the vertical height of the supposed anti-cyclone need not be sufficient to interfere with upper currents, it might in fact rest as a cushion on the land surface almost independent of the general circulation.

Granting the existence of the polar anti-cyclone, it is not difficult to imagine that the moist warm air ascending from the low-pressure zone moves southwards and feeds the anti-cyclone, discharging large quantities of moisture as snow and sleet, and also in the form of crystals deposited from mist, as the temperature is reduced by the ice sheet; and since the supply of vapour is greatest during the more open season in the low-pressure belt, it seems likely that precipitation is greatest during summer. Such climatic conditions are fully sufficient to account for the presence of glacier ice in almost unlimited quantity, provided we assume the existence of continental land, an assumption strongly supported by our knowledge of the Arctic regions, the negative evidence of Grant's Land and the positive of Franz Joseph Land being specially pertinent.

Glaciers of the valley or Alpine type are found on the most stupendous scale; Ross describes one on the east coast of Victoria Land as filling a valley bordered by mountains 6000 to 10,000 feet in height, and sending a tongue far into the sea. But the distinctive feature is the inland ice, known as yet only by the insurmountable cliffs facing the sea. This barrier is remarkable for the uniformity of height it retains for long distances; from the volcanoes Erebus and Terror Ross traced it eastwards for 250 miles, and gives the narrow limits of 150 to 200 feet, Wilkes gives for other parts 150 feet, d'Urville 100 to 150 feet, and Biscoe 100 to 120 feet; in Grahamsland on the other hand only 12 to 14 feet is stated. Again, the barrier-ice is noted by the absence of detritus, or moraine material of any kind.

The stormy weather of the southern ocean, and the strength of the tidal streams are in themselves almost sufficient to prove that the barrier-ice is not field-ice formed at sea, but essentially inland ice, and of this further evidence may be derived from its structure. Wilkes, Webster, d'Urville, and in particular the *Challenger* Expedition, give information derived from the examination of icebergs, and agree in describing the ice as of a stratiform structure, their blue layers of hard ice alternating with thicker beds of white soft ice enclosing air, the latter thicker and softer near the top of the ice, and the former preponderating in the lower strata. Similar formations have been observed by Nansen and Payer, and the presumption is that the soft strata represent snow fallen during winter, and the hard a surface partially melted during the warmer months and re-frozen. Under great pressure the whole mass is gradually converted into homogeneous hard blue ice.

Concerning the several motions of the inland ice, we are without information of any kind. Of the various computations as to its mean thickness, Dr. Fricker adopts that of Thomson—1400 feet.

According to Heim, there are four possible agencies tending towards the dissolution of glacier ice—melting from above, melting from below, internal melting, and the breaking away of drift ice. From the considerations stated above it appears

that Antarctic glaciers are chiefly exposed to the second and last of these, the action of warm water eating away the under surface, and the separation of enormous ice-bergs. Under the most moderate estimates Dr. Fricker calculates that a minimum of 258,000,000,000 cubic metres of ice are annually detached from the ice-barrier and set adrift. The subsequent wanderings of these bergs are chiefly controlled by the ocean currents, although the direct influence of wind is considerable, and the normal "northern limit of drift-ice" is of special interest from the amount of information relating to currents which can—due caution being exercised—be obtained from it. Taken generally, the set of the currents corresponds in direction to the prevailing winds, from south towards north, north-west and west. To this rule there are, however, important exceptions. A comparatively strong easterly current prevails to the south of Cape Horn, probably because of the strong development of the west-wind drift to high latitudes in the South Pacific, and the contraction of Bransfield Strait. Again, the motion of the streams becomes extremely involved in the two cases where the coast trends north and south, east of Gerritsz Land and Victoria Land, in part probably simply tidal, and in part "compensation currents" flowing southwards. Neumayer to the contrary notwithstanding, Dr. Fricker admits the existence of only one true southerly current—to the south of Kerguelen—and of this he proposes an extremely ingenious explanation. Kerguelen and Head Island are connected by a range of submarine mountains some 240 miles in length, which rises to within 100 fathoms of the surface. Assuming that the westerly drift current extends below this depth, on meeting the obstacle it will divide and a part will be deflected in a south-south-easterly direction, and will to some extent retain that direction by virtue of its superiority in speed over the currents of higher latitudes. The other section of the current, deflected northward, may account for the bend of isothermal lines in that direction observed in the vicinity of Kerguelen.

The general northward tendency of the surface currents, taken along with the known presence of Antarctic water in the lower depths of the oceans of the southern hemisphere, raises a question of considerable difficulty as to the nature of the return or compensation current. Dr. Fricker offers a solution of the problem, based on the temperature observations of the *Challenger* and the *Gazelle*, which concur in showing a stratum of relatively warm water at depths between 700 and 900 fathoms in all oceans. The bottom water, moving slowly northward, is ultimately stopped and forced to ascend (the phenomena are naturally most fully developed in the Indian Ocean), its temperature greatly raised, and finally its density so increased by evaporation that it sinks to a position of equilibrium at an intermediate depth and flows southwards, tending at the same time eastwards through the Earth's rotation as a warm current. On regaining the Antarctic regions the water of this intermediate current is in part absorbed in the formation of ice, and the remainder being thereby increased in density sinks to the bottom and begins its slow return northwards.

THE GEOGRAPHY OF THE TATRA GROUP.

AMONG the proceedings of the Geographical Institute at Vienna, a new report by Dr. Carl Grizzinger deserves special notice. It is entitled, "Studies on the physical geography of the Tatra group," and has particularly reference to climatic conditions. It is meant to supplement the writings of Von Sydow, Warhamek, Koristka, and Le Bon, as well as the report of the physiographical commission appointed by the Academy of Sciences of Cracow. The author considers successively

the orographical, geological, and orometrical conditions, then proceeds to a description of the lakes belonging to the Tatra group, and finally he devotes the whole second half of his work to the climatic conditions of the mountain-range.

The outcome of a comparison between the Alps and the Carpathians is that in contrast with the former, the latter have no definite crystalline zone, forming, as it were, a continuous main ridge, nor is this accompanied by lateral zones of more recent growth. The true mountain-range alone appears in the Carpathians in distinct sections, the highest being the Tatra group. It is therefore quite inadmissible to call this group Central Carpathians in the same sense as one would speak of Central Alps.

The limits of the Tatra group are evidently those formed by nature, similar, in this respect, to the Rilodagh, in the Balkan peninsula; the group itself, however, can be divided into three branches going from west to east, as follows:—Liptau Alps, from the Pass of Kvačan (2214 feet), to the Lilijowe Pass (6395 feet), Higher Tatra from the Lilijowe Pass to the Kopa Pass (5815 feet), Bela Kalkalpen from the Kopa Pass to the Zdjár (3516 feet).

The first altitudes were taken in the Tatra group by the Scottish traveller Robert Townson in 1793; according to him Lemnitz peak (8639 feet) was the highest, and so it was considered up to Karistka's observations, when the Gelsdorf peak (8734 feet) was stated as being the highest summit of the Tatra group, *i.e.*, of the whole Carpathians.

The main statistics of altitudes which alone can allow us to make a true comparison of the orographical conditions are shortly as follows:—

—	Length of main ridge.	Mean altitude of ridge.	Mean altitude of chief peak.	Mean height.	Mean height of mountain border.	Mean altitude of masses.
	Miles.	Feet.	Feet.	Feet.		
Liptau Alps . . .	26½	6860	7000	5879		
Higher Tatra . . .	16	7720	8350	6812		
Bela Kalkalpen . .	4½	5560	6960	5077		
Tatra Group . . .	47	6420	5302	5828	3004	4887

The mean altitude of masses, this important orometric factor, adopted by Humboldt, gives the altitude to which the mass of the mountains would reach if one imagines all the heights and hollows of its sky-line as being levelled.

There are one hundred and twenty lakes in the Tatra group, of which one hundred and thirteen are in the higher Tatra. All the lakes are situated in the granite, none in the calcareous district; the same fact was noticed in the Pyrenees and in the Eastern Alps by Penck.

The lakes are all found at a height of 3900 feet to 7200 feet above sea-level, and fully eighty per cent. of them are between 5000 and 7200 feet. This rich belt of lakes is quite analogous to the one of the Eastern Alps, mentioned by Böhm—excepting that (taking into account the more northerly situation of the Tatra group), its lakes are situated lower down than in the Alps. As in the Alps the mean height of the range also influences the comparative elevation of the lake zone, while in the lower Liptau Alps it stretches from 5000 feet to 6000 feet. It reaches in the Higher Tatra from 5000 to 7000 feet. Again the exposure is a determining

condition, for nearly seventy per cent. of the Tatra lakes are situated on the southern slope, and are sheltered by higher lateral ridges. One also notices an increase in the elevation of the lakes, and in their number from west to east, just as is the case with the snow patches of the Tatra. This distribution of altitude in the lakes connected with the appearance of "Roches moutonnées" and other glacial forms, including mounds of moraine material, undoubtedly connect these mountain lakes with former glaciation of the Tatra group; as was remarked by Parisch in 1882. Half of the lakes occupy distinct rock-basins, *i.e.*, all those situated higher than 5000 feet. The majority of those occurring lower are moraine lakes. The mean difference of altitude between these and the rock basins is 1600 feet. As these moraine lakes represent the terminal portions of ancient glaciers from which they had gradually melted upwards to the rock basins Dr. Grizzinger considers himself justified in assuming that the variation in altitude being 1600 feet corresponds to a difference in temperature of $36^{\circ}\cdot5$ F., and seems to give the total amount of increase in temperature since the glacial period.

Dr. Grizzinger's observations on the fall of temperature of the lake water in proportion to its depth are also interesting, inasmuch as it is the first survey of the kind made in the mountain lakes of Eastern Europe. All the soundings were taken in August and always during the early afternoon.

—	Lake Fisch (N.).	Lake Csöber (S.).	Lake Popper (S.).	Lake Eis (S.).
Above sea level . . .	4539 feet.	4431 feet.	4929 feet.	6888 feet.
Mean depth . . .	123 "	68 "	48 "	11 "
Area . . .	80 acres.	50 acres.	36 acres.	0·25 acre.
Depth in feet :—	F.	F.	F.	F.
3½	52·2°	60·4°	53·4°	46·4°
6½	51·8°	60·3°	52·3°	45·5°
10	51·4°	59·7°	52·0°	44·4°
13	51·3°	59°	51·1°	
16½	51·1°	58·6°	50·7°	
33	46·6°	43·8°	45·1°	
66	41·9°	42·6°		
100	40·3°			

We see that the lakes having a southern exposure show in proportion to their altitude,—first a warmer water-surface, and second, a quicker fall of temperature relatively to depth. Such is Lake Fisch, which has a northerly aspect.

So far as these observations relate to the climatic conditions of the Tatra group the investigator systematically kept separate the results of observations of the meteorological stations situated north of the main range from those taken on the southern ones in order to eventually arrive at the conclusion that the Tatra group had a climatic influence. This had not been authenticated before, but it can be actually and accurately proved both by the temperature and by the distribution of wind, and in a less degree by the cloud system; while the rainfall cannot be taken into account at all.

The whole southern district shows on an average of fifteen years a temperature of $1^{\circ}\cdot8^{\circ}$ Fahr. over the northern parts. The well-known Spa, Neu-Schmecks (3296 feet), is $2^{\circ}\cdot5^{\circ}$ Fahr. warmer than Javorina situated on the northern slope of the range at an elevation of 3250 feet. Javorina is the highest meteorological station in the Carpathians (a summit station not yet existing in the whole mountain district).

With reference to seasons, it is interesting to note that on the north side

autumn is warmer than spring, while the reverse is the case on the southern side. Comparing the decrease in temperature in relation to the altitude, which in this part is 1° Fahr. for every 328 feet (just as in the Alps), Dr. Grizzinger estimates the level of the isotherm of 32° Fahr. for the year, on the northern side at 5726 feet, and on the southern side at 6212 feet. The height of this important line thus almost entirely coincides with the orographic snow limit established by the same investigator after previously made observations which have already been published.

The highest summits of the Tatra thus overtop the snow limit by 1968 to 2295 feet. The very steep incline prevents any *connected* snow covering from being formed, but there are about forty snow-patches, of which two-thirds are on the southern slope.

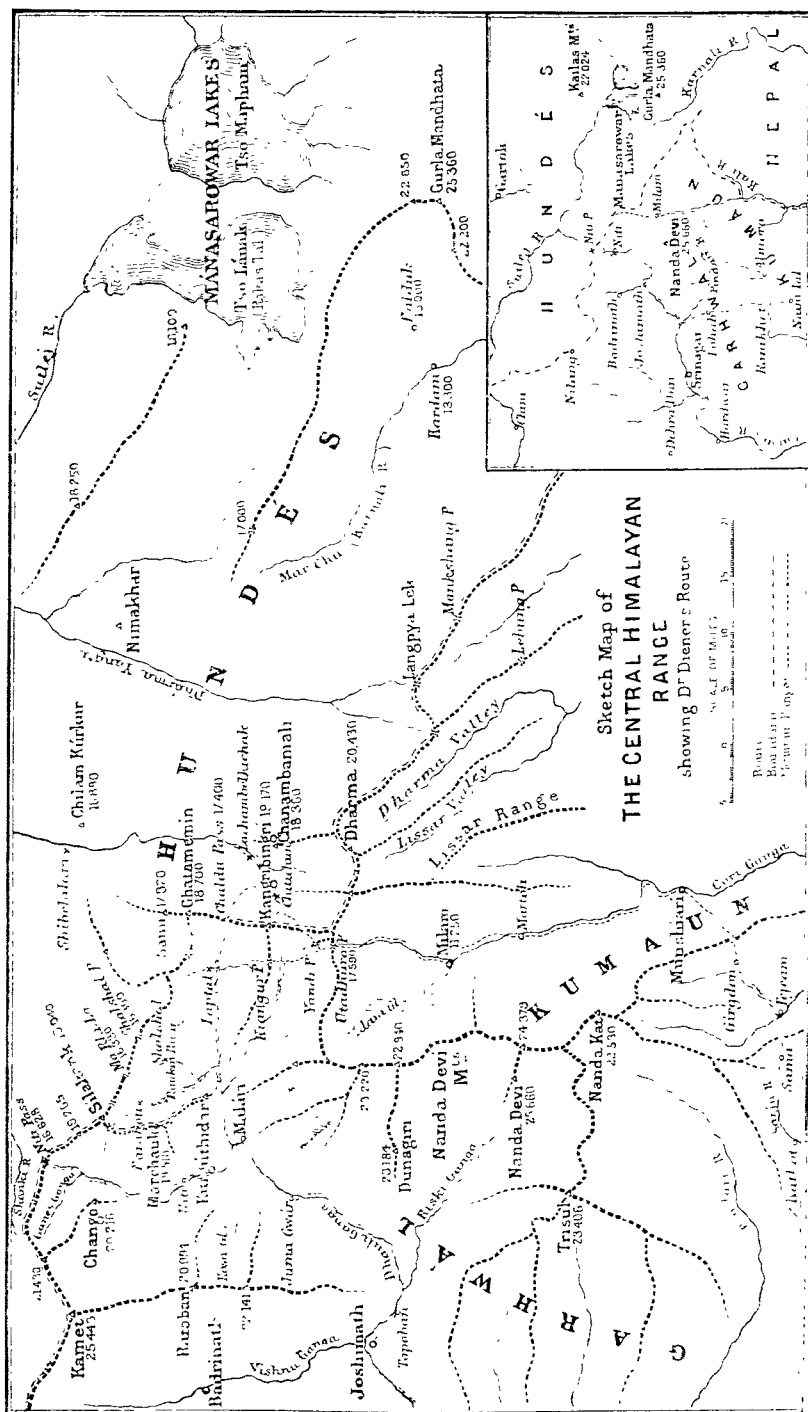
With reference to the distribution of winds we find, as Supan had already remarked, westerly winds on the north slope, while on the southern side, which is not directly sheltered by the main range, northerly winds prevail. A further and more typical contrast between the north and south slopes is in the proportion of winds to calms, the south side giving a much more favourable record. In Neu-Schmecks, which is sheltered by the main range, the proportion of calms to winds is seven to three. The author refers also to the probable existence of a "Föhn," in the Tatra group, analogous to the well-known warm Alpine wind, which would alone explain the remarkable variations in temperature noticed in winter on the north slope and contrasting strangely with otherwise exposed stations.

The cloud system shows a maximum in the north during December and in the south during November, the average being greater on the northern than on the southern slope.

DR. DIENER'S EXPEDITION TO THE CENTRAL HIMALAYA.*

THIS expedition to the Central Himalaya, Kumaon, Garhwal and Hundés was undertaken in 1892 at the instance of the Vienna Academy of Sciences and of the Indian Government, with the object of studying more closely the trias deposits on the Tibetan frontier. Besides Dr. Diener, Messrs. L. Griesbach and C. S. Middlemiss, representing the Geological Survey of India, took part in the expedition. The starting-point of the expedition was the sanitarium of Naini Tal, whence they proceeded with seven servants and eighty-five coolies through Munshiari to Milam. The coolies were changed from station to station and carried a load of forty pounds weight for the sum of four annas. Milam is situated at an altitude of 11,250 feet, and is the highest inhabited (only from May to October) village in the Bhot Mahals, *i.e.* in the Tibetan border region. It lies above the tree limit, although buckwheat and potatoes are cultivated in the vicinity. The border trade with Tibet forms the chief means of subsistence of the inhabitants, among whom are many wealthy persons whose property comprises often several thousand sheep and goats. The whole of the Tibetan trade is carried on with the aid of these animals, and what the camel is in the desert, the sheep is in the Himalayan regions. Rice and meal are carried by these animals in a kind of saddle pouch on both sides of the back. The Milam glacier, which terminates at a height of 11,340 feet at a distance of 2 miles north-west of Milam, is the largest of the ice-streams of the Nanda Devi group, and is 12 miles in length. Owing to the very slight fall, it has no

* Report of a paper read before the Geographical Society of Berlin, June 3rd, 1893.



remarkable breaks, and is completely covered with moraine rubbish. Its tributaries also are long, narrow ice-streams lying between steep walls, thus accounting for the great development of the surface moraines. After lengthy negotiations with the Tibetan frontier-guard permission was obtained to explore the border region lying immediately to the north of Milam. On June 19th the expedition set out over the Utadhura Pass (17,590 feet) to the upper Girthi valley, where on the southern slopes of the Bambanag Range (19,000 feet) some trias formations, very rich in fossils, were found. From here the journey was continued over the Kiangur Pass (17,000 feet), and the Kisgarh-Chaldu Pass (17,400 feet) to that part of Hundés, bordering it on the east, which had not hitherto been geologically explored, viz., the district of the pasture-grounds of Lachambelkichak and Chitichun. Here the expedition stayed during the whole of the latter half of July, and ascended four times the peak of Chitichun No. 1 (17,740 feet) and the two Chanambaniali summits (18,320 and 18,360 feet). After the party had been detained at a bivouac (17,000 feet) for three days by a snowstorm, they succeeded in scaling the summit of Kangribringri (19,170 feet), whence they returned over the Yandi Pass to Milam, arriving there on July 30th. During these five weeks, their camp was never pitched at a lower altitude than 14,500 feet. From the top of Chanambaniali they were able to distinguish the contour of the basin, in which the Manasarowar lakes, with their area of 310 square miles, lie imbedded at an altitude of 15,300 feet. In the southern part of the mountain circle the three summits of Gurla Mandhata (25,360 feet) stood out very strikingly; this mountain, with its mighty glaciers, completely dominates the surrounding region. It was not the cold and rarity of the air that formed the most serious obstacles to scientific work at these altitudes, but the storms which blew from the south, day by day with equal violence, and which were so heavy that photographs could only be taken when the apparatus was protected by the erection of a circular wall of stones. The difference between the day and night temperatures was very large, and found expression in the difference in the volume of water in the glacier streams. While at daybreak most of these streams could be conveniently waded, soon after sunrise they were swollen to mighty rivers often within a quarter of an hour. The region of the pasture-grounds of Chitichun is one of the most desolate parts of the province of Hundés.

The bottom of the valleys does not descend below 16,000 feet, and the vegetation is so scanty that even the juniper bushes are seldom seen. Frequently dried pieces of turf and yak's dung form the only kind of fuel. The whole country bears most distinctly the stamp of the desert; the mountains are girded with a mantle of *débris* from which only the actual summits project. It is only the intense yellowish red and violet of the rocks that moderates to some extent the doleful uniformity of the country. It was found to be impossible to penetrate into the Lissar Range in consequence of the impassability of this region for beasts of burden, and also because of the lack of provisions for coolies. It was therefore determined to advance into the territory of Rumkin Paiar, which is claimed by the Tibetans, and also to the Niti Pass, and on August 18th the march was commenced through Utadhara and the Kiangur Pass. In the pasture-ground of Laptal the expedition encountered a Tibetan frontier-guard composed of six men, but their opposition was overcome by presents and by the resolute demeanour of the expedition. The march was then continued along the southern slopes of the watershed, which consists of bare slate and sandstone mountains rising from 17,000 to 18,000 feet. Numerous herds of Tibetan steppe-horses were met with here, also kyangs and mountain sheep, the stately *Ovis Hodgsoni* and *Ovis Burghal*. Frequent traces of bears, white leopards, and Tibetan wolves (*Canis laniger*) were seen. It would be difficult to find anywhere in the world, even in the Grand Cañon of the Colorado,

more magnificent geological sections than those which are presented by the limestone zone of the Central Himalaya in the vicinity of Rimkin Païar and on the Silakank, where in places one can see at a glance the whole series of the marine deposits from the Lower Silurian up to the chalk.

In contrast with the uniform character of the country between Laptal and Barahoti, the green Alpine meadows of Rimkin are refreshing to the eyes. Along the watercourse in sheltered places may be seen dense thickets of salix and birches. Isolated specimens of larches, 16 to 23 feet high, with wonderfully crooked trunks, grow up to a height of 14,000 feet, otherwise in the Central Himalaya the tree-limit lies between 11,000 and 12,000 feet.

At the time when the expedition was in the country the Tibetan shepherds were busy collecting dry branches, which are in request at the festival games which take place at Gartok on the Upper Indus, a proof of the value of this material in Hundés, which is so poor in fuel and timber. The weather was uncommonly bad here; no less than twenty-six rainy days were counted in August.

In the valley of Dhaulī Ganga, into which the expedition descended after having advanced to the Niti Pass (16,628 feet), the most frequented pass of the Central Himalaya watershed, and the vicinity of which is covered up to a height of 17,300 feet with glacier rubbish of the upper carboniferous quartzite, were found from a height of 9000 feet upwards numerous traces of an ice-age in the formation of mighty remains of old moraines. The village of Niti lies somewhat higher than that at Milam, 11,464 feet.

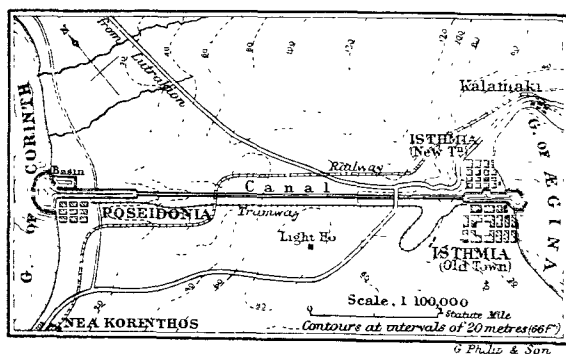
In the Dhaulī Ganga valley forest vegetation extends up to 11,000 feet: the forests are composed principally of the magnificent deodar cedar, which at Juma Gwar forms beautiful forests. From Joshimath the expedition followed the usual route of the Badrinath pilgrims through Lohab and arrived once more at Nainī Tal on October 7th, 1892.

THE MONTHLY RECORD.

EUROPE.

The Corinth Canal.—The opening of the Corinth Canal on August 6th adds one more to our international highroads of commerce, and although this, the most recent of ship canals, is not at all likely to effect a revolution in the world's trade, such as has been brought about by the opening of the Suez Canal, it is all the same of considerable local importance. Vessels bound from the Adriatic to the Piræus, Smyrna, and Constantinople, and making use of this canal, will not only effect a saving in distance of about 120 miles, but they will also avoid the dreaded Cape Matapan, the doubling of which is attended with danger during the winter months. Anciently the Isthmus of Corinth was crossed by a road for the conveyance of merchandise and small boats. Periandros of Corinth, who lived about six hundred years before Christ, is credited with the intention of substituting a canal for this road; but nothing was done until the advent of the Romans. Julius Cæsar, who rebuilt Corinth in 46 B.C., seriously entertained the project, and Nero actually employed thousands of Jewish captives and convicts upon the work, but his attention was drawn elsewhere when J. J. Vindex, the Roman governor of Gallia Lugdunensis, revolted in A.D. 68, and proclaimed Galba emperor. It was thus reserved for General Türr to realise the project of the ancient Greeks and Romans. In 1881 he secured a concession from the Greek Government for building the canal. Work

was actually begun in May 1882 by a French company, and on its failure it has been completed by a Greek one, with M. Matsas as engineer. Very considerable engineering difficulties had to be overcome, as the isthmus rises to a height of 200 feet. The Canal is 26 feet deep, 72 feet wide, and 6890 yards in length. It



begins about $1\frac{1}{2}$ mile to the north of New Corinth, quite a modern town, built since 1858, in which year an earthquake destroyed the ancient city, and terminates near the spot where the Isthmian games used to be celebrated. Two new towns, of ambitious dimensions, have been laid out at its termini, one being called Poseidonia, the other Isthmia.

Submergence of Western Europe.—Dr. Joseph Prestwich recently contributed a paper to the Royal Society on “The evidences of a submergence of Western Europe and of the Mediterranean Coasts at the close of the Glacial and immediately preceding the Neolithic period.” The evidence mainly consists of beds of “rubble drift” and osseous breccia which are found over Western Europe and the shores of the Mediterranean, the loess over parts of Central Europe, and animal remains in fissures on isolated hills. From these facts the author infers an extended but comparatively shallow submergence of short duration, which did not allow time for marine sedimentation. The principal geographical evidence is found on the northern and southern coasts of France, at Gibraltar, in Sicily, Malta, and Greece. On the Palestinian coast there are but few traces of the peculiar drift, and the submergence there must have been small, if any. On the North African coast evidence of submergence is found at Tetuan and Oran; but towards the east the depth must have been slight, and perhaps in this direction the submergence did not extend beyond the Libyan desert. The author concludes also that in estimating the time that has elapsed since the Post-Glacial Period a measure of ten thousand to twelve thousand years is a closer approximation than ninety thousand.

Scandinavia and the Level of the Sea.—A German correspondent sends us the following supplementary statement regarding Dr. Sieger's work on the upheaval of Scandinavia, briefly referred to in the August number, p. 171:—“The first point discussed by Dr. Sieger is the shift of relative level on the Swedish coasts. Formerly this was attributed to a local or to a general fall of the water surface, and it was asserted that the same phenomenon was noticeable in the lakes and rivers of the country. Since the time of Playfair and Buch, however, the existence of an *upheaval* of the land has been admitted; while R. Chambers, Trautschold, and especially Suess, returned to the older opinion. According to Suess the Baltic is higher than the ocean, on account of the volume of fresh water

poured into it by rivers; but as these decrease in volume the sea-level sinks slowly, until it will eventually reach that of the ocean. Such a fall must be preceded by similar shrinkage of the inland lakes. Sieger tries to prove this by means of observations dating back to 1774, taken on eight Swedish and seven Norwegian lakes. The annual range is principally determined by the diminished precipitation in winter, and the epoch of snow-melting in various parts of the country, which reaches its maximum in spring and in early summer. The Baltic, which reaches its lowest level at the same period, continues to rise until the precipitation attains its maximum in late summer and autumn. A second rise in the sea takes place in December, and is not noticeable in the lakes, except in the few which are almost at the sea-level. This is not a regular occurrence, but due to special causes of a rather complicated nature, the direction of the wind being an important factor. Since observations have been started, no change in the yearly curve of the sea-level is traceable. On comparing the levels of different years with each other, deviations are observed which correspond exactly to the thirty-five years' range of climatic variations arrived at by Brückner. On the Swedish coast, as well as on that of Finland, and in the Kattegat, we can distinctly trace a decrease in the level; on the other hand, such a change is absolutely unknown in the lakes excepting in Mälär, near Stockholm, the investigation of which would necessitate exhaustive and special investigations, as its conditions are quite peculiar. In determining the amount of decrease for various places we must consider variations of climate. We can, therefore, only compare simultaneous observations, and often we may be in doubt whether apparent exceptional conditions are not perhaps the result of varying periods of observation. However, it seems to be clear that there exists a zone of greater change of level near Gefle and Wasa, the upheaval lessening again towards north and south. The writer rather inclines towards a theory of upheaval of the continent than towards that of a local fall of sea-level, such as Suess considers probable. How much of this is due to general movements of the sea can only be determined when we possess observations extending over many years in Norway."

AFRICA.

Dr. Gregory's Expedition to Mount Kenia.—Dr. J. W. Gregory arrived at Mombasa on August 19th, after a successful expedition to Lake Baringo. He returned *via* Likipia and Mount Kenia, and ascended the latter to a height of more than 17,000 feet. Dr. Gregory has explored the glaciers and head-waters of the Tana, and the water-partings between the Tana and Athi Rivers.

Mr. Selous.—Mr. F. C. Selous sailed on August 26th for South Africa, *en route* for Mashonaland. His sudden departure is due to the threatened troubles with Lobengula. He hopes to arrive at Victoria in about a month, and if things are quiet he will return at once.

Ruins in Mashonaland.—Mr. R. M. W. Swan writes as follows from near Maklutsi: "I have examined two ruined temples of the Zimbabwe period and style, situated at the confluence of the Lotsani and Limpopo Rivers in S. lat. 22° 39' 42", E. long. 28° 16' 30". The temples show the same system of orientation and geometrical construction as the great temple at Zimbabwe. I cleared the bush from the more perfect of the two temples on the Lotsani and made a careful measurement of many of the radii of the one curve of which it consists. I oriented directly from the centre of the curve and saw the sun from that point setting just

to the left of the middle of the main doorway. On correcting the position of the sun for its decrease in declination during the seventeen days which had elapsed since the solstice, I found that it would set at the solstice exactly in a line with the centre of the arc and the middle of the doorway. This direct measurement and observation should remove any doubt as to the applicability of our theory of the construction of the plans of these temples." Mr. Swan adds that he has travelled 350 miles along the Limpopo River and has made some important rectifications of positions, details of which will be forwarded to the Society at an early date.

Uganda.—The British occupation of Uganda necessitating the presence in Africa of experienced officers, who understand Arabic and can handle the Sudanese troops, Colonel Colville of the Grenadier Guards, Captain Gibb, Captain Besant and Captain Thurston, have been sent to act under Sir Gerald Portal, the administrator of the country. Colonel Colville's experience in Africa is already considerable. He served under Lord Wolseley in the Sudan, and subsequently made an extensive journey through Africa and Madagascar, which is well described in his wife's newly-published book, 'Round the Black Man's Garden,' noticed in these pages last month.

New Expedition in French Congo Territory.—The *Politique Coloniale* announces the departure from Marseilles, on August 10th, of an exploring party, despatched by the Société d'études du Congo Français, to study the valley of the Kwilu-Niadi (Noari-Quiliou) with the view of testing its suitability for a railway from the coast at Loanga to Brazzaville on Stanley Pool. The expedition is divided into three departments under the general leadership of M. A. Le Châtelier. The survey party is commanded by Captain Cornille, who was recently connected with the projects for a French Sudan railway. Botanical studies are under the charge of Dr. Lecomte and Captain Lamy, and the geology of the country traversed will be studied by M. Regnault.

Kling's Last Journey in Togo Land.*—Captain Kling, it will be remembered, died from dysentery on September 15th last, soon after his return to Germany. On his last journey he proceeded from the coast through Salaga to Bismarckburg, whence he set out with his expedition on October 21st, 1891, for the north-east. Following first of all the general line of Dr. Wolf's route, he paid a visit to the Sultan Jabo Bukari of Shanchö, and delivered to him the imperial presents; then at Wangara, the capital of Sugu, he left Wolf's route on November 24th, in order to penetrate directly north into Western Borgu. Borgu is governed by three brothers, of whom the one living in Nikki is the most powerful. Western Borgu is ruled over by the Sultan of Kwembe, and the southern part is under the sway of the Sultan of Birni. At Birni Kling met with a very friendly reception, but when he had arrived within about 7½ miles of the capital (Kwembe) messengers from the Sultan of that place told him that the king would not have any white men in the country, because the first white man (Dr. Wolf) who had come to Borgu had brought so much misfortune on the land. It was after Wolf's death (1889) that a civil war, occasioning much bloodshed, broke out over the question whether the white men should be allowed into the country. Kling, therefore, retraced his steps to Birni, where the Sultan of the place protected him against the exactions of the people. From Birni he returned

* Report of a paper read by Dr. von Danckelman before the Geographical Society of Berlin, June 3rd, 1893.

to Alejo along the same route as that by which he had come, and marched from there along the great Hausa caravan route, which had never before been trodden by a white man, passing through the uncommonly well-populated regions of Bafilo, Basari, San Sugu to Salaga, where he arrived on January 19th, 1892. From this point he determined, with the object of studying the slave-trade, to proceed to Kintampo, which he reached on January 30th, having followed Binger's route. On the way he fell in with numerous Hausa caravans, each with a large number of slaves, who although fettered with iron-collars, were dragging very heavy loads of kola nuts. In Kintampo the slave-trade flourishes to an even greater extent than in Salaga. Kling made his way back from Kintampo to Salaga by a wide detour to the north, *viâ* Bupe. The whole region between the two places is a level savanna. The pyramids of skulls of buffaloes, antelopes, elephants and hippopotami, which are erected at numerous points, give evidence of an enormous wealth of game. As Kling on this circular journey crossed only two arms of the Volta, it is probable that the Red Volta unites with the White Volta, and not, as hitherto shown on the maps, with the most southerly or Black Volta. From Salaga Kling returned through Kratye to Bismarckburg, where he arrived on March 11th, 1892, already suffering from dysentery. From the traveller's route-surveys and numerous astronomical observations it has been possible to construct a map of his journeys, which forms an important extension of our knowledge of the geography of the countries between the Volta and the Niger. His expedition has had the further result of showing that the regions between the Borgu and Salaga States, as well as the countries of Shanchi and Dagombo, are much superior in fertility and density of population to the districts lying nearer to the coast. Thus for example Bafilo, a place of about fifteen thousand huts, far surpasses Salaga both in size and importance. Agriculture and cattle-rearing are in a most flourishing condition in these countries: the traveller passes through miles of yam and millet-fields, which are cultivated by large bands of quiet, unassuming slaves, who march out from the villages to their work at the sound of the drum and fife.

AMERICA.

Geological History of Lake Superior.—Professor A. C. Lawson contributes to the Annual Report of the Geological and Natural History Survey of Minnesota a valuable paper on "The abandoned strands of Lake Superior." The investigation, which was begun in 1891, chiefly concerns the evidence for abandoned coast-lines on the northern shore of the lake. These strands represent stages in the extent of a sheet of water which was very different in its general physiography from the present Lake Superior. It must have been many times more extensive, covering the entire region of the lakes Huron and Michigan with several hundred feet of water. Its whole extent was probably twice as great as the combined areas of Superior, Huron, and Michigan, and the Algonquin beach on the coast of Huron marks only an episode in the later stages of shrinking. The name Lake Warren is given to this great sheet of water from its highest state down to that stage where its waters became definitely segregated into the different subordinate depressions. The number of observable strand lines on the coast of Lake Superior varies from one to nineteen; in portions of the coast none can be detected. This discrepancy is partly due to obscuration of the topography by timber, while the differences between observed beaches and terraces almost contiguous to one another may be due either to the fact that the coastal slope is not equally susceptible at every point of registering the shore-lines, or to the fact that terraces have been obliterated by wave action at

lower levels. Or possibly the differences may be due to differential movements within the limits of the present lake basin; a portion of the coast may have changed its altitude relatively to the outlet, or the entire coast may have changed its inclination. In the former case there would not, even with a complete record, be the same number of strand lines in every part of the coast; in the latter there would be an equal number of lines, but all would converge upon the outlet. The tables of elevations supplied prove that there is a prevailing constancy of vertical interval between the strand lines, and this fact points to an uniform subsidence of the water along the entire extent of the coast. In the table there are recorded thirty-three strands having distinct altitudes; in the history of the recession of the lake there have thus been at least thirty-two stages. The maximum number of strands observed in one place is nineteen. Each of the many stages of Lake Warren must have had its level determined by a definite outlet, and the means of the lowering of the outlet was probably crustal deformation. The place in which evidence of such changes should be looked for lies to the south and south-east of Lakes Michigan and Huron. The general result of the movements which lowered the southern barrier of Lake Warren seems to have been an elevation of a large part of Central Canada, and a relative or absolute depression of the States Ohio and Indiana. It is possible that before this elevation of Canada the drainage of the lake was towards Hudson's Bay. The portage south of the divide between the Hudson's Bay and St. Lawrence systems of drainage has an elevation of 500 feet above the present level of Lake Superior. It appears to be the abandoned bed of a large river. Now one of the most heavily marked of the abandoned strand lines has an altitude of 509 feet above the lake. It may be inferred that Stage XXX. of the lake was determined by the altitude of this pass to the north. About 50 miles north-east of Michipicoten harbour there is another pass, at an altitude of 440 feet; if it ever served as an outlet to Lake Warren it is doubtless to be correlated with Stage XXVI., which has a strongly-marked strand line at Sault Ste. Marie. There are other possible outlets: the valley of the St. Croix River, the Illinois River, the Fort Wayne channel, the Nipissing depression, and the Whitefish Valley through Little Bay de Noc.

The Geography of Ecuador.—With a volume entitled 'Geografia y Geologia del Ecuador,' Don Teodoro Wolf, the government geologist, publishes an important map of Ecuador, on which he has been occupied for the last fifteen years. It supersedes the worthless compilation of Villavicencio, which appeared in 1858. All the parts of Wolf's map have not the same value. Some extensive portions, especially in the coast provinces, are based on exact triangulation, others on compass surveys, while compilation from older maps had to be resorted to for unvisited districts. On the whole, the result is very successful, and Mr. Wolf has produced a map which is beyond comparison superior to anything that has gone before. His chief merit is in having surveyed the coast region between the Pacific and the Cordillera, from the Tumbez on the Peruvian, to the Mira on the Colombian frontier, a region previously almost unmapped, and filled up by Villavicencio with imaginary ranges. Mr. Wolf found many corrections to be necessary in the interior regions, even where the French Academicians and Humboldt had worked. The eastern part of Ecuador within the Amazonian valley, except the courses of the larger rivers, remains unexplored and unknown. Mr. Wolf gives a lucid general description of the orography of Ecuador, and enables the student to understand the general features of the Cordilleras, as well as to become acquainted with their geographical details. He also explains the geological conformation, and devotes chapters to the meteorology and to biological distribution. He refers, with appreciation, to the labours of Mr. Whymper; and acknowledges the value of the little map drawn by our Associate,

Mr. Spruce, to illustrate his report on the red-bark trees (*Cinchona succirubra*) of Ecuador. Both Mr. Wolf's map, and the volume which accompanies it, are valuable contributions to geographical knowledge.

The Upper Amazons.—Richard Payer, whose energetic efforts in behalf of improved communication between Peru and the Atlantic have been noted from time to time for some years past in *Petermanns Mittheilungen*, in a recent number describes his latest journey from Lima to Iquitos on the Upper Amazons, by way of the Ucayali. Besides giving a vivid picture of the difficulties of travel along the steep and slippery paths in the Andes, and down the rushing streams, which flow from their eastern slope, his letter contains interesting notes on the Tyrolese colony, which for over forty years has maintained a precarious existence on the Pozuzo, one of the side feeders of the Ucayali system, but which is now at last in course of extinction through the migration of most of the families to a more favourable climate on the Ochobamba Plateau. The difficulties which the German settlers have had to contend against arose partly from the nature of the spot chosen (these might have been avoided had recourse been had to the experience of disinterested persons at the outset) and partly from the jealousy and opposition of the Peruvians, which went so far as to stir up the natives against the settlers. The writer comments severely on the want of energy and judgment shown by the Peruvian authorities, which renders fruitless all efforts to improve the communication between Lima and the Upper Amazons, as well as on the recent attempts to attract fresh German settlers, while no steps are taken to provide help or accommodation for them in the wilderness to which they are invited. The colony of Pozuzo was founded by Damian v. Schütz and the priest, Joseph Egg, for emigrants who came mostly from the German Tyrol and from the Rhine. Although its chances for progress were great, it has not increased as it ought to have done, on account of the causes already noted, the unsettled state of the Peruvian Government, and the war between Peru and Chile (1879–1882). V. Schütz, just before his death (1883), gave an exhaustive account of his work in his book called ‘Amazonas.’ According to Payer coca could have been cultivated with profit in Pozuzo, and last year a French company was even contemplating to raise capital for that purpose. The number of the colonists was five hundred and fifteen at the end of last year, to which may be added about one hundred and thirty Indians and half-castes. The principal products are tobacco, and coffee, and coca. A German has founded a factory of cocaine in Lima, where the coca of Pozuzo finds ready sale. The neighbourhood is free from epidemic diseases, and its only physician (a homœopath) is the already-mentioned Tyrolese priest, Joseph Egg, who has laboured faithfully amongst the emigrants for the last thirty-five years. During the years 1874–1889, when no subsidy arrived from his Government, the priest earned his living as a turner, making spinning wheels.

Soil and Vegetation of the North-West Argentine Republic.—Dr. L. Brackebusch, of Cordova, who has for some years been occupied in collecting material for a comprehensive work on the physical geography of the Argentine Republic, though the publication at Government expense has been interrupted by the financial crisis, deals, in *Petermanns Mittheilungen* for July last, with the conditions of soil in the north-west part of the Republic, with special reference to the vegetation. His paper is illustrated by two maps, one showing the relief of the land, the other the distinctive characteristics of soil and vegetation in its various parts. Two areas of inland drainage are distinguished, one a plateau region, mainly included within the higher ranges of the Cordillera, the other that of the streams

which flow from the eastern slopes, but eventually lose themselves in the plains below. There are two other hydrographical regions, that of the tributaries of the Parana in the north, and that of the streams which, when full, find their way to the Rio Colorado in the south. The principal natural divisions of the country dealt with are the snowy summits, volcanoes, and sterile ridges of the Cordilleras; and, in descending order, high-level sand-dunes, slopes of *débris*, Alpine pastures, low-level dunes, salt flats, forests, and pampas. The upper sand-dunes show much analogy with glaciers, descending the upper valleys under the action of the winds. They are composed of the *débris* of volcanic and other crystalline rocks, which become mingled and constantly ground smaller whilst carried along by violent storms. The lower dunes, which stretch eastwards from the foot of the mountains, are likewise brought by the winds from the bare slopes of glacial *débris* which fringe the outer ranges. The salt-flats owe their origin, in Dr. Brakebusch's opinion, to the salt brought by streams from the Western Cordillera, which contains jurassic and cretaceous strata of marine origin, including even now beds of rock-salt. Many of the streams which now reach the Colorado once formed stagnant lakes on the sites of the present salt-flats. The Alpine pastures, of varying character, support horses, cattle, goats, swine, and sheep where free from bush. They pass more or less gradually into forests, either the sub-tropical moist forests of the lower slopes, or the dry forests of the Chaco. The former especially supply timber, while the best bark for tanning is obtained from the latter, which may be again subdivided according to the species of trees which predominate. Cultivation is most extensive in the districts to the east, where the rainfall is more abundant and regular. In the more inland parts it can only be carried on with the aid of irrigation.

The Andes of Western Colombia.—Dr. Hettner, whose monograph on the Andes of Bogotá was noticed in the *Proceedings* for December last, has lately given in *Petermanns Mitteilungen* a sketch of the mountain system of the West of Colombia. The two main chains here form direct continuations of those of Ecuador, from which they differ however in showing fewer traces of volcanic action. North of 4° N. lat. a separate coast chain, with strata of recent formation, appears. Volcanoes occur only in the most southerly portion of the western chain, which is remarkable for its regularity and even direction. North of the transverse valley of the Patia, the greatest height reached is 11,150 feet, and the lowest pass 6725 feet. In the south the spurs sink at right angles to the main ridge, while further north several parallel ridges occur. The central depression is mainly occupied by the longitudinal valleys of the Patia and Cauca, and only in the south is it formed, as in Ecuador, by a series of basins, sending their waters east or west. The Cauca, which flows partly through plains of horizontal recent formations, and partly through rocky defiles, penetrates within the Central Cordillera by a bend between 5° and 6° N. lat. In the last-named range volcanoes are found further north than in the Western, a broken series of volcanic peaks reaching as far as 5° N. lat., in parts above the snow-line. The two chains seem to unite in the mountain complex of Antióquia. Of the arrangement of the ridges here little is known, but the most important seems a northern continuation of the western chain. In the Andes of Western Colombia the constituent rocks are chiefly gneiss, crystalline slates, and granite, with strata of cretaceous and, perhaps, tertiary age. In parts the cretaceous strata seem to pass gradually into crystalline slates in the neighbourhood of eruptive rocks. On the whole, the formations to the west are of later date than to the east. All, except the quaternary, are tilted, and the range is therefore one of elevation and mainly of tertiary age. The central depression

may be compared to that of the Upper Rhone and Rhine, but the presence of volcanoes suggests that its formation was more largely due to fracture. The range of Santa Marta resembles the group of Antióquia in structure, and probably forms the continuation of this, the main line of the Andes, the Cordillera of Bogotá being really a distinct chain.

AUSTRALASIA.

Australian Settlers and the Native Flora.—The *Journal* of the Royal Society of New South Wales for 1892 publishes a paper entitled "Effect of Settlement on Indigenous Vegetation in Australia," by A. G. Hamilton, who deals with the subject under the main headings of (1) The actual destruction of the flora in clearing land, with the indirect action of the latter through alteration of surface, climate and fauna; (2) The effect on the flora of the introduction of a new fauna, and destruction of the native animals; (3) The modification of the flora by the competition of introduced plants. Few statistics as to the destruction of forests in the various colonies are available, but in New South Wales, where the original forest area (principally on the coast district, table-lands, and mountains), may be estimated at about one-third of the colony, it seems that at least a third has been swept away within a century, in clearing for cultivation, roads, townships, etc., and in felling timber. Many of the most valuable kinds of timber trees, especially the group of eucalypts known as "iron barks," have been nearly exterminated in parts, and others are becoming scarce. It may be hoped, however, that reforestation of various districts will be carried out under the present Government policy. Not only are the forest trees destroyed in clearing, but the whole flora which sprang up under their shade is affected, and as is seen in many other parts of the world, if the ground is left fallow a distinct set of plants takes its place, pines and wattles often springing up where other forest is cleared, while isolated big trees left standing do not long survive their fellows. An instance is given where the light let in by clearing a road benefited certain species of trees, rare before, so that a perfect hedge of these sprang up on each side of the cleared space. The removal of the protection afforded to the soil by grass and herbage has an important effect in altering the surface drainage. Channels are cut, and much soil removed, the roots of neighbouring trees being laid bare, and the moisture necessary for their growth drained off. The much-vexed question of the effect of forests upon rainfall is discussed by the writer, who gives it as his opinion that deforesting does not diminish rainfall, but that it dries the air, and increases the effects of hot winds, besides causing the water to drain more readily out of the soil. These results, he thinks, have a decided effect in modifying the flora. The checking of bush fires, which have an important influence on the flora, benefiting some plants and injuring others, must have acted in just the converse ways. Of introduced animals, rabbits do immense damage to vegetation, especially in dry seasons, when hunger drives them to attack plants which they do not usually touch. While these injure pastures especially, hares principally attack crops and introduced trees. The indigenous flora also suffers much from the pasturing of cattle and sheep, owing to the over-stocking which is prevalent, and which threatens the prosperity of the colony, unless suitable measures, such as the storage of fodder, or the conservation of rainfall for irrigation, are resorted to. The paths made by cattle on hill-slopes also alter the surface drainage in a way similar to that mentioned above. The effects which may be produced by modification of the fauna are very various, owing to the complex relations existing between different groups of organic beings. Thus the destruction of the insect-eating marsupials would lead to the increase of certain insects which may be either

beneficial or hurtful to plants, while that of the dingo has led to a great increase of grass-eating marsupials, and plants have been largely affected thereby. Under the last heading the writer shows how various plants are introduced, and how railways, roads and enclosures help them to spread, while the fact that the Australian flora has for so long been removed from outside competition places it at a disadvantage as against old-world weeds, which under competition have acquired an adaptability to varying circumstances. These conditions do not always last, however, as the native plants sometimes recover a portion of the lost ground. In conclusion a list of introduced plants, with an indication of some of the reasons which have helped them to spread, is given.

The Delimitation of the Anglo-Dutch Boundary in New Guinea.—

For a long period the Tugeri tribes which live on the Dutch side of the 141st meridian of east longitude—the nominal boundary line between the two powers in that region—have proved a great source of trouble to the administration of British New Guinea, by their constant piratical raids into our possession. Their depredations are chiefly made against the tribes about the mouth of the Fly and Maikassa Rivers. Since these districts lie far distant from the headquarters of the Government, it has invariably happened that by the time that a protective or punitive force could reach the scene, the marauders, whose descents are naturally not intimidated beforehand, have made off across the boundary into Dutch territory, whither the administrator has no right to follow them. The Netherlands Government have none of their officers stationed anywhere near this boundary—a low-lying, very unhealthy region of no commercial importance, at present at least. It constantly happens, therefore, that these Tugeri pirates escape scot-free. Sir W. Macgregor has, we believe, more than once given them chase and pursued them to a certain point. But for his uncertainty of the actual position of the boundary-line, and his desire not to carry war into the territory of a friendly neighbour, he would have continued till he had come up with them. He has long urged on the government the necessity for fixing a boundary more recognisable when reached than a meridian. It is satisfactory, therefore, to learn that the delimitation was effected in the most friendly manner in the beginning of March last by Resident Beusbach, of Ternate, and Sir W. Macgregor, respectively representing the sovereigns of the two countries concerned. An interesting account of the proceedings is given in a despatch from the Administrator of British New Guinea to the Governor of Queensland, by whom it has been communicated to the Secretary of State for the Colonies. As a Dutch man-of-war visited the locality some years ago and marked a tree near the 141st meridian of east longitude, the Dutch officers knew approximately where the boundary was. It was, therefore, arranged to land at a small creek—now called Java Creek, about 3 miles west of the boundary—and attempt to fix the position. The coast there unfortunately proved so muddy and swampy that no landing could be effected. A few miles further west, however, a large freshwater creek was discovered, now named Beusbach Creek, where, although it was not a very satisfactory place, the observing instruments were mounted. The officers of the Dutch war-vessel *Java* were provided with very excellent instruments, while those possessed by Sir William Macgregor and Mr. Cameron, Government Surveyor, were smaller and less perfect. Lieut. Meyjes, of the *Java*, accomplished his task in one day, while the Administrator and his companion were obliged to remain ashore for two days and nights to try to obtain between the rain squalls, which unfortunately prevailed, the necessary sights. The result of the observations of Lieut. Meyjes, R.D.N., placed the spot of observation in $9^{\circ} 7' 34'' \cdot 9$ S. lat., $141^{\circ} 1' 47'' \cdot 9$ E. long., while those of Sir

William Macgregor and Mr. Cameron made it $9^{\circ} 7' 42''$ S. lat., and $141^{\circ} 1' 46''$ E. long., both positions depending on the position of the Admiralty observing spot at the Post Office, Thursday Island, being $10^{\circ} 35' 8''$ S. lat., and $142^{\circ} 13' 14''$ E. long. After considering the whole subject on the data at their disposal, and after Resident Beusbach had visited the boundary, both representatives agreed to recommend to their respective Governments that the boundary should be as follows:—Beginning on the south coast of New Guinea, at the middle of the mouth of the Beusbach River, which is about latitude $9^{\circ} 7' 35''$ S. lat., and $141^{\circ} 1' 48''$ E. long., proceeding thence northwards on the same longitude until the line meets the Fly River, about latitude 7° S., thence following the Fly River until it reaches the 141° of E. longitude about latitude $6^{\circ} 20'$ S., thence along the line of 141° of E. longitude to the point where the British, Dutch, and German boundaries meet in 5° S. latitude. A small strip of useless British territory of about 280 square miles would pass to the Netherlands, and some 280 square miles would pass from the Netherlands to the British Crown. On the coast there would be a well-defined boundary that could not be lost or mistaken. It is a suitable place for ships to be posted in to intercept marauders, as there is shelter, concealment, and water. Anything that will facilitate the task of the Dutch Government in settling the Tugeri tribes will be of indirect advantage to the British. The Queensland Government has acquiesced in the proposed rectification, and it only now requires the confirmation of the two European Governments to be the future boundary of New Guinea in this region. The piratical visits of the Tugeri may now, with the facilities which the new boundary offers for checkmating them, be considered to be drawing to an end.

Chatham Islands.—The *Journal of the Polynesian Society* for June 1893 contains a continuation of Mr. A. Shand's interesting history of the Maori occupation of this group. The present instalment (Parts IV. and V.) describes the dissensions and fights that soon arose between the Maori tribes that had come over from New Zealand and taken possession of the country of the Morioris. Their final disposal in the islands was accomplished through the intervention of the New Zealand Company's agent, Mr. Hanson (afterwards Chief Justice of South Australia), while the intertribal discords ceased at last on the introduction of Christianity in 1842. Part V. gives an account of the migration of some of these Maori settlers, in 1843, to the Auckland Islands, "owing to the limited area of the Chatham Islands, taken together with the fact that many of the Maoris did not obtain land in their own right." "Tauru Matioro . . . with a number of Ngatimutunga taking their Moriori slaves with them, joined him in chartering a Sydney brig named *Huanah* and proceeded to those islands. Almost immediately after landing a party proceeded . . . to take possession of the island. On going over it, however, they found it was peaty, bleak, and evidently quite unsuitable for them to live on." Accordingly some of their number returned at once on board the vessel, which set sail in a surreptitious manner for the Chatham Islands, "leaving the greater number to get on as they best could at the Auckland Islands." Several years after their arrival a whaling party settled on the islands and remained for some years. During this time quarrels and dissensions had arisen among the Maoris, and when the whaling settlement broke up Matioro and a section of his party were taken to Stewarts Island. Meanwhile the relatives in the Chatham Island of those still left in the Aucklands chartered a vessel to bring them all home again. They first called at Stewarts Island, picked up those there, and proceeding to the Auckland Islands took on board the survivors of the migration and brought them to Waitangi. There they lived till 1868, when, after the escape of Te Kooti from

his "island prison" at the Chatham Islands, all "the Maoris, with the exception of a few, returned to their old homes in Tarauki, New Zealand, where they now live."

The Island of Niue.—By an unnoticed printer's error, a note relating to *Niue*, or Savage Island, in the August number, gave the name as Nine Island. The error has been pointed out by several correspondents, who state that the word is trisyllabic, pronounced Ni-u-e.

POLAR REGIONS.

Dr. Nansen's Progress.—Dr. Nansen telegraphs to the Society from Yugor Strait, at the entrance to the Kara Sea, on August 3rd, the message reaching the Vardö telegraph-office on August 23rd. All on board the *Fram* were in the best health and spirits, satisfied with their voyage so far, and full of hope for its final success. Leaving Vardö on July 21st (see *ante*, p. 174), a good voyage was made to Novaya Zemlya, the only unpleasant episodes being the occurrence of fogs and contrary winds. Gooseland, in Novaya Zemlya (lat. 72° N.), was sighted on the 25th. The telegram is a little obscure on this point, the literal reading being, "Passage from Norway to Novaya Zemlya good, only wind, fog, Goseland on Novaya Zemlya in it 25 July; met fog and contrary wind; met ice 27 July, 69 grades 50 minutes N.D. 50 grades E. gr." The probable meaning is that the *Fram* was driven off her course by the contrary wind, and so came in sight of Novaya Zemlya too far north. Turning southward she took two days to make 150 miles, and on the 27th ran into the ice in lat. $69^{\circ} 50'$ N., long. 50° E., about 10 miles north-east of the Island of Kolguev. The telegram goes on to state that they forced their way through the ice, the *Fram* proving a splendid ship for the purpose, and reached Yugor Strait on the 29th, making a run of 250 miles in two days. Considering the low speed and small engine-power of the *Fram* this was a remarkable passage in an ice-encumbered sea. The coal-ship which was to have been waiting at Yugor Strait had not arrived, but having sufficient coal on board Dr. Nansen intended to sail into the Kara Sea on August 3rd rather than risk delay by waiting. He took on board the "thirty-four splendid sledge-dogs from Siberia" which were waiting for his arrival. Yugor Strait was found to have been open since July 3rd, and little ice was reported in the southern part of the Kara Sea, a fortunate southerly wind having driven the pack northward. The best route eastward was close along the shore keeping to the open water, and Dr. Nansen considered his prospects very favourable. If the ice does not turn out worse than reported he hoped to reach the New Siberian Islands before the end of August, and if he does so he considers success almost certain. The *Fram* will touch at the Olonets River near the Lena delta, if there is time, and Dr. Nansen will send farther news from there. The telegram concludes with "heartly greetings" to the Society. The following are the names of Dr. Nansen's companions:—

Captain Otto Sverdrup, master of the ship; Sigurd Scott Hansen, lieutenant in the Norwegian Navy, director of the astronomical, meteorological, magnetical, and other observations; Henrik Blessing, surgeon and botanist; Claudius Theodor Jacobsen, mate; Peder Henriksen, harpoonist; Anton Amundsen, first engineer; Lars Pettersen, second engineer; Hjalmar Johannesen, lieutenant in the Norwegian Army, at present fireman on board, but prepared to turn his hand to anything; Bernhard Nordahl, electrical assistant; Ivar Otto Irgens Mogstad, carpenter and general utility man; Adolf Juell, steward.

Lieutenant Peary's Arctic Expedition.—Mr. E. Astrup, second in command of Lieutenant Peary's expedition, which recently started, writes to a correspondent as follows:—"Sealer *Fulcon*, July 5th, 1893. On this journey we really start from the terminal point of last expedition, and our firm intention is not to rest until we have mapped the entire north-east shores of Greenland and any adjacent islands; and, if fortunate, we hope to proceed further north still. In his land journeys Peary relies entirely on the strength of man, and the endurance of the tough, frugal North Greenland dogs. Without the latter, any inland journey would be futile. His outfit is of the simplest kind, this expedition having cost only about £1,450 to equip, and we are fourteen persons provisioned for over two years. Our prospects are most promising. Our house for winter quarters will be larger than last year's—33 feet by 14 feet, and contain several rooms. It will be heated with paraffin stoves, and lighted with twenty glow-lamps. The latter will be a capital boon, our dynamo being worked by the engine of our steam launch. The launch cannot fail to be of very great use for our scientific excursions, when the water is open. Our provisions consist of all the usual kinds of dried and tinned foods, but we partly rely on the delicious reindeer-meat to be got in Greenland as well. The accoutrement of sledges, ski, arms, and tents is complete; likewise our collection of instruments. We have several large cameras for photographs, and a phonograph, in which we hope to collect specimens of the Eskimo dialect, songs, and melodies. Another novelty is the attempt to use Colorado mules on the ice; they are said to be very enduring, and can stand the severest cold. Their special purpose is to carry our stores from the winter quarters on the shore up to the inland ice, for our journey, a distance of 6 miles, includes a rise of 5000 feet. This work nearly killed us last time. Of dogs, we have on board two St. Bernards and six Eskimo, the latter being survivors from the last expedition; but more will be purchased in South Greenland, so that, on arriving in Whale Sound, we shall have about a hundred, which will not be at all too many. We have been obliged to take our dogs thus far away, as it is to be feared we nearly exhausted the stock of our northern friends in 1892. Mrs. Peary again accompanies her husband, an especially courageous act, as she is expecting shortly to become a mother. Her attendant and cook is a Mrs. Cross. Dr. Vincent, the surgeon, is a new member, twenty-eight years of age. Mr. Entrikin, engineer, is to build our house, whilst Peary maps Inglefield Gulf, and I undertake a journey right away to Independence Bay, with Messrs. Carr and Lee, meteorologist and zoologist respectively. An artist, Mr. Stokes, is also a member."

GENERAL.

The Improvement of Geographical Teaching.—Professor W. M. Dav's writes on "The Improvement of Geographical Teaching" to the July number of No. III.—SEPTEMBER, 1893.]

The National Geographic Magazine. He believes that improvement is demanded in three directions—a fuller investigation of facts, a better knowledge of the facts by teachers, and a more skilful use of them in the processes of teaching. The want of detailed personal exploration of the neighbouring country, and the old-fashioned and lifeless geographical descriptions in the text-books are mentioned as the main hindrances to an exact knowledge of geographical facts. What is wanted is not simply a description of the forms of the land, but a recognition of the forms as dependent on structure and sculpture, and a comparison of like and unlike forms. Professor Davis illustrates his meaning by references to New England geography, where the uplands, with their residual mountains, represent the closing stages of one cycle of development, and the valleys represent the beginning of another; and by a comparison between the New England plateau and the Hunsrück-Taunus plateau. He shows how all geographical features studied out in such a manner became luminous and interesting to scholars and teachers. The results of glacial action, too, are overlooked by most American text-books, yet evidences of these must be familiar to every schoolboy. Professor Davis does not think any progress can be made in his scheme of systematic geography without the recognition of two principles. The first is that every land-form passes through a systematic series of changes from its youth, when its form is defined chiefly by constructional processes, past its maturity, when the processes of sub-aerial sculpture have carved a variety of mouldings and channellings, to its old age in which denudation reduces the mass to base-level. This unmeasured time he calls a geographical cycle. The second principle is that during a geographical cycle a land-area may be disturbed by depression or elevation; the combination then developed produces “composite topography.” A recognition of these principles would greatly advance the descriptions, and the appreciation of geographical conditions. Professor Davis urges on the directors of the various state geological surveys, to devote some time to the study of the physical features of their state in the light of modern geographical science; and he concludes by asserting the great need of text-books, prepared by persons familiar with local geography.

Political Division of the Earth.—A. Oppel (*Ausland*, 1893, No. 5) divides all the lands of the Globe into three classes, viz.: (1) The uninhabited or “ownerless” tracts, such as the ice-covered portion of Greenland, total area, 1,694,000 square miles; (2) Those with no definite political organisation, as the Sahara, etc., total area, 5,023,000 square miles; and (3) States, with an area of 45,100,000 square miles. Under the last heading both colonies and protectorates are assigned to the respective mother-countries, the minimum extent being allowed in cases of uncertainty. Thus Bokhara, Sokoto, Matabeleland, etc., rank as states, while the Galla countries come under the second main heading. Of a total of seventy-five states, eighteen (comprising 87 per cent. of the surface occupied by the whole) have an area of over 1,000,000 square kilometres, or about 386,000 square miles each; thirty-six have over one-tenth of that amount; and twenty-two a still smaller area. Venezuela comes within the first group, but not Spain; while Bulgaria stands at the head of the third. More than half of the total area is occupied by European states and their dependencies, these last being five and a half times larger than the continent of Europe itself. Twenty-six states are republics and forty-nine monarchies, the former occupying roughly two-sevenths of the whole area. The population of the states taken together is estimated at 1,420,000,000, and of the tracts without that status about 45,000,000. The British and Chinese Empires together include about half the population of the states, and European countries roughly account for four-sevenths.

OBITUARY.

Dr. John Rae, F.R.S.—An old hero of Arctic travel has passed away, in the person of Dr. John Rae, who died at his house in Addison Gardens on July 22nd last. Although eighty years of age, Dr. Rae enjoyed excellent health to within a few months of his death, and took a prominent part in the proceedings of the Royal Geographical Society, the Colonial Institute, and other public bodies, and in all matters relating to the regions where the greater part of his early life was passed. The qualities which fitted him so pre-eminently for the arduous service he performed in high latitudes also ensured him popularity and esteem at home. The geniality of his manner, and his readiness to help, by advice or instruction, will long be lovingly remembered by many. Dr. Rae was a keen sportsman and an ardent volunteer; he himself attributed much of his success in exploration to the certainty of his aim; and on all his expeditions he kept his party supplied with food by his gun.

Born in Orkney on September 30th, 1813, Rae found himself from his earliest years in an environment of adventure; and he must have been familiar from infancy with stories of the Arctic fur-traders and whalers, since Orkney and Shetland have always been the recruiting ground for whalers and the Hudson's Bay Company. At an early age Rae went to Edinburgh to study medicine, and there he qualified as a surgeon in 1833. His first professional experience was a voyage in one of the Hudson's Bay ships, and this proved so much to his mind, that he joined the service of the Company, and for ten years resided at Moose Factory. It was not, however, until June 1846 that he set out on his first journey of pure exploration—a boat voyage along the coast of Hudson's Bay to Repulse Bay. Here he passed the winter successfully, and early in the following year made a long land journey, in which he surveyed 700 miles of new coast-line, connecting the surveys of Ross in Boothia with those of Parry at Fury and Hecla Strait. The only book Dr. Rae published was a short account of this expedition, which appeared in 1850 under the title, 'Narrative of an Expedition to the Shores of the Arctic Sea.'

A visit to London was shortened by Dr. Rae joining the expedition down the Mackenzie River in search of Sir John Franklin under Sir John Richardson in 1848. Another very interesting journey was the result, in the course of which the whole coast of the Arctic Sea between the Mackenzie and the Coppermine Rivers was explored. In 1851, at the request of Government, Rae undertook a new expedition in which, with the slenderest outfit possible, he explored and mapped the south coast of Wollaston Land and Victoria Land in search of news of Franklin. A slight conception of the enormous difficulties which attended land travel in Canada in those days is given by the fact that on the return journey Rae had to walk on snow-shoes, dragging a sledge all the way, from the Arctic Sea through Fort Garry (now Winnipeg) into United States territory before he could get any other means of conveyance to an open seaport. The expedition mapped 700 miles of new coast. Returning to London Dr. Rae received the gold medal of the Royal Geographical Society, which was presented in a speech full of cordial appreciation by Sir Roderick Murchison.

In 1853 the Hudson's Bay Company fitted out another boat expedition, on the express condition that Dr. Rae should take command. This he did and with even more than his customary success. His surveys proved the insular character of King William's Land, and his intercourse with the Eskimo elicited the first definite information as to Sir John Franklin's fate, and secured many relics of the gallant officers who had stuck to their duty until, as the Eskimo said, "they

dropped down as they walked and died." For this discovery the Admiralty awarded to Dr. Rae the grant of £10,000, offered by Government for the first authentic news of the lost expedition; and although the search for Franklin was not stopped the subsequent expeditions only succeeded in substantiating Rae's report.

This was the last piece of purely Arctic work he did, although in 1860 and following years he travelled through Iceland, Greenland, and various parts of North America, surveying for telegraph lines, always doing his work with great accuracy and making observations of wide scientific value.

Dr. Rae was a man of action with a constitutional shrinking from multiplying words. The reports of his journeys published in the *Journal*, R.G.S., Vol. XXII., pp. 73, 82, and Vol. XXV. 246, are brief and unadorned. Latterly Dr. Rae read several papers to the British Association on the navigation of Hudson's Bay, on the best route for Polar exploration, which he believed to be by Spitzbergen, and on the depth of permanently frozen soil in North America, but these are only published in abstract. He was the author of several papers on the Eskimo, a people whom he had very carefully studied. Dr. Rae attributed his own success in Arctic travel to his power of living in Eskimo fashion. To save carrying a tent he frequently built a snow-hut every night as he travelled, and his skill as a sportsman enabled him to reduce the supply of preserved provisions very greatly. Altogether he walked over 23,000 miles in the course of his Arctic journeys.

Dr. Rae served on the Council of this Society on four occasions, and frequently acted on Committees dealing with Arctic questions. He has been buried in Kirkwall, and it is proposed to erect a memorial in the ancient cathedral of St. Magnus in that town.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
 Ann. = Annals, Annales, Annalen.
 B. = Bulletin, Bollettino, Boletim.
 Com. = Commerce, Commercial.
 C. R. = Comptes Rendus.
 Erdk. = Erdkunde.
 G. = Geography, Geographie, Geografia.
 Ges. = Gesellschaft.
 I. = Institute, Institution.
 J. = Journal.
 M. = Mitteilungen.

Mag. = Magazine.
 P. = Proceedings.
 R. = Royal.
 Rev. = Review, Revue, Revista.
 S. = Society, Société, Selskab.
 Sitzb. = Sitzungsbericht.
 T. = Transactions.
 V. = Verein.
 Verh. = Verhandlungen.
 W. = Wissenschaft, and compounds.
 Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Adriatic. *Deutsche G. Blätt.* 16 (1893): 127-149. **Gelcich.**
 Die österreichisch-ungarischen Kurorte am Adriatischen Meere. Von E. Gelcich.

Notes on the climate and other conditions of the eastern Adriatic health resorts, especially Abbazia, the island of Lussin, Cirkveniza, and Grado.

Austria—Bohemia. *Ausland* (1893): 353–355, 372–375. **Günther.**
Der Kammerbühl. Eine vulkanistische Studie. Von S. Günther.

British Islands. *Scottish G. Mag.* 9 (1893): 393–402. **Dickson.**
On Sunshine. By H. N. Dickson, F.R.S.E.

The question as to what constitutes sunshine is discussed from the meteorological standpoint, and the recent Meteorological Office report on the Sunshine of the British Islands is summarised. The paper is illustrated by a map—we believe the first of its kind—showing the geographical distribution of sunshine in the British islands.

Greece—Zante. *Petermanns M.* 39 (1893): 166–174. **Mitzopulos.**
Das grosse Erdbeben auf der Insel Zante im Jahre 1893. Von Prof. Dr. Constantin Mitzopulos in Athen. *Map.*

Pyrenees. **D'Almeida.**
Les Pyrénées. Développement de la Connaissance Géographique de la Chaîne. Par P. Camena D'Almeida. Paris, Armand Colin et Cie. *Not dated* (1893): size 9 × 5½, pp. 328. *Presented by the Author.*

This valuable monograph on historical geography will be noticed separately.

Rhine. *M. k.k. G. Ges. Wien.* 36 (1893): 315–328. **Oelwein.**
Die Regulirung des Rheines zwischen Vorarlberg und der Schweiz und die Entwässerung des Tieflandes. Von Prof. A. Oelwein.

Russia—Baltic Provinces. **Bielenstein.**
Die Grenzen des Lettischen Volksstammes und der Lettischen Sprache in der Gegenwart und im 13. Jahrhundert. Ein Beitrag zur ethnologischen Geographie und Geschichte Russlands. Von Dr. A. Bielenstein ev.-luth. Pastor zu Doblen in Kurland. Mit einem Atlas von 7 Blättern. St. Petersburg, 1892: size 13½ × 10, pp. xvi. and 548. *Price 7 roubles.*

The record of thirty years' research investigating in minute detail a small but important department of the historical geography of Europe. The first part (only 24 pp.) summarises the present distribution of the Letts, who number about a million and a quarter. Part II., comprising all the rest of the work, relates to the distribution of the various Lettish tribes in the 13th century, with many valuable remarks on ancient geography and the origin of place-names.

Switzerland—Thur. *Vierteljahrsschrift Naturforsch. Ges. Zurich* 38 (1893): 108. **Eberli.**
Eine Flussablenkung in der Ostschweiz. Von Dr. J. Eberli in Zürich.
With map.

The River Thur before the Ice-age is shown to have turned westwards and flowed into the Töss; but the formation of a moraine across its upper valley diverted the stream which now flows eastward and joins the River Sitter.

ASIA.

Afghanistan—Herat. *Scottish G. Mag.* 9 (1893): 403–8. **Yate.**
Colonel Yate's Mission to Herat and the Kushk Valley. By Captain A. C. Yate, R.S.C.

Himalaya. *Verh. Ges. Erdk. Berlin* 20 (1893): 297–313. **Diener.**
Herr Dr. Carl Diener: Ueber seine Expedition in den Central-Himalaya von Kumaon, Hundes und Garwhal. *With map.*

India, Ancient Topography. *Indian Antiquary* 22 (1893): 169–195. **Fleet.**
The Topographical List of the Brihat-Samhita. By J. F. Fleet, R.N.

A list with notes indicating the probable position of the places mentioned in the Brihat-Samhita of Varahamihura, intended as a contribution towards the preparation of a map of ancient India, which may be added to by similar lists and discussions of the places mentioned in other books.

India.**Birdwood and Foster.**

The Register of Letters, &c., of the Governor and Company of Merchants of London Trading into the East Indies, 1600-1619. Edited by Sir George Birdwood, M.D., F.C.I.E., assisted by William Foster, B.A. London, Quaritch, 1893: size 10 × 6½, pp. lxxxiv. and 530. *Presented by the Publisher.*

This first letter-book of the East India Company is richly annotated by Sir George Birdwood, and contains in quaint form a wealth of information as to the commencement of British influence in India.

India—Economic Products.**Watt.**

A Dictionary of the Economic Products of India. By George Watt, M.B., C.M., F.L.S., assisted by numerous contributors. Vols. i. to vi. (parts i. and ii.) Calcutta (London, W. H. Allen & Co.), 1889-1893. Size 10 × 6½. *Presented by the Government of India.*

In compiling the present work Dr. Watt has made use of a number of standard works dealing with the products of India, a list of which follows the preface; he has also derived much assistance from specialists, no pains having been spared to ensure accuracy and completeness. The articles mainly deal with the botanical products of India, in most cases including medical notes, and are sufficiently full and comprehensive for all ordinary purposes.

Indo-China—Tribes. *B. American G. S.* 25 (1893): 289-303.**Rosset.**

The Wild Peoples of Farther India. By C. W. Rosset, Freiburg in Baden.

Notes, with illustrations, of the Moi, Stieng, Ahong and Beunong peoples inhabiting the country between 11° and 13° N., and 106° 20', and 108° 20' E.

Korea. *S. Normande G. (Rouen)* 14 (1892): 384-418, 15 (1893): 1-18. **Chaillé-Long.**

La Corée ou Chûson (la Terre du calme matinal). Par M. le Colonel Chaillé-Long-Bey. *With map of Quelpart.*

Malay Archipelago. *Ausland* (1893): 357-360, 375-378, 391-393.**Bergemann.**

Der Malayische Archipel im Lichte des Zeitalters der Entdeckungen. Von P. Bergemann (Jena).

Siam.*Rev. Française* 17 (1893): 538-545.**Demanche.**

La France et le Siam au Laos. [Par] G. Demanche. *With map.*

Siberian Railway.*Petermanns M.* 39 (1893): 102-112.**Immanuel.**

Russische Eisenbahnbauten in Asien in ihrer Bedeutung für die Landeskultur und der Weltverkehr. Von F. Immanuel. *With map.*

AFRICA.**Angola.***B. American G. S.* 25 (1893): 304-312.**Chatelain.**

Geographic Names of Angola, West Africa. By Heli Chatelain. *With map.*

Egypt.**Robecchi-Bricchetti.**

All' Oasi di Giove Ammone. Viaggio di L. Robecchi-Bricchetti con 164 incisione e una grande carta geografica. Milano, Fratelli Treves, 1890: size 12 × 8½, pp. 374. *Presented by the Author.*

A finely illustrated account of a journey to the oasis of Jupiter Ammon in the Libyan Desert.

Madagascar.*Z. Ges. Erdk. Berlin* 28 (1893): 137-160.**Voeltzkow.**

Von Beseva nach Soalala, Reiseskizze aus West-Madagaskar. Von Dr. A. Voeltzkow in Mojanga.

This paper is illustrated by a map showing the route taken and the district explored on the journey.

Morocco.*Deutsche Rundschau* 15 (1893): 337-348, 437-448.**Rohlf.**

Marokkanische Städtebilder. Von Gerhard Rohlf. *With illustrations.*

Seychelles. *Rev. Française* 17 (1893): 433-447. **Fauvel.**

L'Archipel des Seychelles. Etude de Cartographie. Par. A. A. Fauvel.

Illustrated by reproductions of early maps of the islands.

Somaliland. **Robecchi-Bricchetti.**

Itinerario del viaggio da Obbia ad Alula dell' Ingegnere Luigi Robecchi-Bricchetti. Size $12\frac{1}{2} \times 8\frac{1}{2}$, pp. 20, *maps*.

Tradizione Storiche dei Somali Miguirtini. Raccolta in Obbia dall' Ingegnere L. Robecchi-Bricchetti. Size $12\frac{1}{2} \times 8\frac{1}{2}$, pp. 24. Rome, 1891.

Presented by the Author.

These are reports published by the Italian Department of Foreign Affairs.

Somaliland. *B.S.G. Italiana* 6 (1893): 355-384. **Robecchi-Bricchetti.**

La prima traversata della Penisola dei Somali, dall'ing. L. Bricchetti-Robecchi. (*With map*).

South Africa. *J. R. Colonial Inst.* 24 (1893): 545-560. **Selous.**

Incidents of a Hunter's Life in South Africa. By F. C. Selous.

Togo. *M. Forsch. Deutschen Schutzgeb.* 6 (1893): 105-254. **Kling and Büttner.**

Ergebnisse der Forschungsreisen im Hinterlande von Togo 1890 bis 1892, von Hauptmann E. Kling und Dr. R. Büttner.

The whole third part of vol. vi. of this journal is occupied by an account of the journey into the hinterland of Togo, carried out by Kling and Büttner, including short articles by specialists on the various departments of natural history which were represented in the collections made. There is a map and a series of photographs showing the native types and characteristic scenery.

Tunis. **Pennesi.**

Tunisi e il suo nuovo porto. Prof. Giuseppe Pennesi. Estratto dalla *Rassegna Navale*. Anno. I. No. 7, size 10×7 , pp. 12. *Presented by the Author.*

Tunis. **Venukoff.**

M. Venukoff. La Tunisie contemporaine (février 1893). [In Russian.] Size $10 \times 6\frac{1}{2}$, pp. 29. *Presented by the Author.*

Uganda. *Ausland* (1893): 360-363, 378-381. **Förster.**

Die geschichtliche Entwicklung Ugandas von 1875-1892. Von Brix Förster. (München).

Uganda. *J. Manchester G. S.* 8 (1892): 101-114. **Lugard.**

Uganda: its value to British Trade. By Captain F. D. Lugard.

West Africa. *B.S.G. Lyon* 11 (1893): 585-613. **Monteil.**

De l'Atlantique a la Méditerranée par le lac Tchad. Par M. le commandant Monteil. *With map*.

West Africa. *B. S. Khéliv. G.* (1893): 717-759. **Rogozinski.**

Huit Années d'exploration dans l'ouest de l'Afrique Equatoriale, par le Comm. Etienne de Rogozinski.

NORTH AMERICA.

America—Discovery. *M. Verh. Erdk. Leipzig* (1892): 57-89. **Mogk.**

Die Entdeckung Amerikas durch die Nordgermanen. Von E. Mogk.

Mount St. Elias. *National G. Mag. (Washington)* 4 (1893): 63-67. **Mendenhall.**

The Geographical Position and Height of Mount Saint Elias. By Dr. T. C. Mendenhall.

The position found by the Boundary Commission in 1892 was $60^{\circ} 17' 35''$ N. $140^{\circ} 55' 21.5''$ W., and the mean height deduced from several triangulations 18,010 feet

- United States—California.** *Sierra Club B. 1* (1893): 40-53. **Koch.**
Through Death Valley. A brief account of a trip from Daggett to
Furnace Creek. By Fred. W. Koch.
- United States—Census.** *National G. Mag. 5* (1893): 21-44. **Gannett.**
The Movements of our Population. By Henry Gannett.
- This is the first comprehensive statement in convenient form of the results of the United States census of 1890. It is illustrated by a profusion of maps and diagrams, and will be summarised in our pages.
- United States—Lakes.** *B. American G. S. 25* (1893): 203-223. **Brigham.**
The Finger Lakes of New York. By Albert P. Brigham.
- United States—Louisiana.** *B.S.R. Belge G. 17* (1893): 164-177. **Serruys.**
La Louisiane sous la domination Espagnole. Par Edmond Serruys.
- United States—Oregon.** *Sierra Club B. 1* (1893): 31-39. **Kerr.**
Crater Lake, Oregon, and the Origin of Wizard Island. By Mark Brickell
Kerr. *Map and illustration.*
- United States—Rainfall.** *National G. Mag. 5* (1893): 45-58. **Greely.**
Rainfall Types of the United States. Annual Report by Vice-President
General A. W. Greely. *With map.*

CENTRAL AND SOUTH AMERICA.

- Argentine Republic.** *Petermanns M. 39* (1893): 153-166. **Brackebusch.**
Ueber die Bodenverhältnisse des nord-westlichen Theiles der Argentinischen Republik mit Bezugnahme auf die Vegetation. Von Prof. Dr.
Ludwig Brackebusch in Cordoba. *Maps.*
- Brazil and Argentine.** *B.S.R.G. Anvers 17* (1893): 207-224. **Georlette.**
La Question des Limites entre le Brésil et la République Argéentine. Par
M. F. A. Georlette. *Map.*
- A discussion by the Consul General of Brazil in Belgium of the question at issue between Brazil and the Argentine republic, regarding the boundary territory which was formerly part of Paraguay.
- British Guiana.** *Timehri 6* (1892): 258-303. **Hunter.**
Gold in British Guiana, its History and Prospects. By Hope Hunter.
- Chiloe.** **Beranger.**
Relacion Jeografica de la Provincia de Chiloé por Don Carlos de Beranger.
Publicada por primera vez con una Introduccion i notas esplicativas por
Nicolas Anrique R. Santiago de Chile. Imprenta Cervantes, 1893.
Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 64. *Presented.*
- This pamphlet contains little of importance regarding the present condition of Chiloe.
- Colombia—Andes.** *Petermanns M. 39* (1893): 129-136. **Hettner.**
Die Anden des westlichen Kolumbiens. Eine orographische Skizze.
Von Dr. Alfred Hettner.
- Dominica.** *Globus 63* (1893): 365-369. **Krause.**
Dominica. Reiseerinnerungen von Dr. med. Ernst H. L. Krause. Kiel.
With illustrations.
- Ecuador, Quito.** *Z. Ges. Erdk. Berlin 28* (1893): 107-136. **Hann.**
Ueber das Klima von Quito, von J. Hann.
- A discussion of the climate of Quito, mainly from the data contained in Dr. Wolf's work on Ecuador.

- Guatemala.** *Globus* 63 (1893): 265-267. **Sapper.**
 Ein Ausflug nach der Südgrenze von Guatemala. Von Dr. Karl Sapper, Coban.
- Guatemala—Volcanoes.** *Globus* 64 (1893): 1-5, 27-31. **Sapper.**
 Die Vulkane der Republik Guatemala von Dr. Karl Sapper. Coban.
With map.
- Honduras.** *B. American G. S.* 25 (1893): 224-235. **Perry.**
 Honduras, by E. W. Perry.
 A sketch of the geography and present condition of the Republic of Honduras.
- Nicaragua.** *Science* 21 (1893): 174-177. **Crawford.**
 Hydrographic Area of the Rio Wanque or Coco in Nicaragua. By J. Crawford, Cape Gracias al Dios, Nicaragua.
 Some useful details concerning the rivers, natural resources and people of the basin of the boundary river between Nicaragua and Honduras.
- Nicaragua.** *B. American G. S.* 25 (1893): 236-288. **De Kalb.**
 Nicaragua, Studies of the Mosquito Shore in 1892. By Courtney de Kalb.
 An article of some interest in view of the international aspects of the Nicaragua Canal. It commences with a historical survey of British intervention on the Mosquito coast, goes on to give a graphic description of the character of the country and of the people, amongst whom Moravian missionaries have been established for forty years, describes their government and laws, showing how while nominally independent under Nicaraguan control the coast is really under the commercial rule of British traders and the ecclesiastical control of Prussian pastors, and concludes with a review of the outlook for the future.
- Peru—Campa Indians.** *Scottish G. Mag.* 9 (1893): 348-359. **Urquhart.**
 Among the Campa Indians of Peru. By D. R. Urquhart, c.e.
 A sketch of the habits and customs, etc., of the little-known Campa Indians of the upper tributaries of the Amazon.

AUSTRALASIA AND PACIFIC ISLANDS.

- New Caledonia.** *Miss. Cathol.* 25 (1893): p. 20, *passim* to p. 129. **Lambert.**
 Les Hypogées de l'île des Pins (Nouvelle Calédonie) Etude d'archéologie païenne. Par le R. P. Lambert.

POLAR REGIONS.

- Arctic Travel.** **Heilprin.**
 The Arctic Problem and Narrative of the Peary Relief Expedition of the Academy of Natural Sciences of Philadelphia. By Angelo Heilprin. Philadelphia: Contemporary Publishing Co., 1893. Size 9 × 6, pp. 166.
Presented by the Author.
 There are six chapters in this little book, dealing respectively with The Arctic Problem, Polar Expeditions, The Spitzbergen Route to the Pole, The Peary Relief Expedition, A Lost Companion (the story of Mr. Verhoeff, naturalist in Peary's party, who mysteriously disappeared just before the return voyage began), and The Greenland Ice-cap and its Glaciers. Professor Heilprin has studied his subject fully, and appears to have come to reasonable and well-balanced conclusions as to the manner in which future Arctic work should be carried out.
- Keenan Island.** *National G. Mag. (Washington)* 4 (1893): 76-83. **Baker and others.**
 An Undiscovered Island off the Northern Coast of Alaska. I., by Marcus Baker; II., by Captain Edward Perry Herendeen; III., by General A. W. Greely.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Astrolabe. *J. Asiatique* 1 (1893): 5-76, 185-231. **Sauvaire, &c.**

Sur une Mère d'Astrolabe Arabe du XIII^e. siècle (609 de l'hégire) portant un Calendrier perpétuel avec Correspondance Musulmane et Chrétienne. Traduction et Interprétation M. H. Sauvaire et M. J. de Rey-Pailhade.

A learned paper describing, with illustrations, part of a remarkable instrument which was found by M. Sauvaire in Cairo in 1873, and explaining its application to a perpetual calendar.

Forests and Climate. *Meteorol. Z. (Vienna)* 10 (1893): 201-214. **Ebermayer.**

Klimatische Wirkung des Waldes auf seine Umgebung. Von E. Ebermayer.

Physical Geography. **Geikie.**

Fragments of Earth Lore, Sketches and Addresses, Geological and Geographical. By James Geikie, D.C.L., LL.D., F.R.S. Edinburgh, John Bartholomew & Co., 1893: size 10 × 6½, pp. vi. and 428. Price 12s. 6d. Presented by the Publishers.

Professor Geikie's scattered papers on glaciation and physical geography published during the last few years are here collected in a handsome volume, with illustrations, and particularly aided by a fine series of maps by Mr. Bartholomew. The papers on the Ice-age, although geographical in their bearing, are purely geological in form, and their argument is somewhat technical, although, like everything Professor Geikie writes, they are shot through with veins of the richest and least obtrusive humour. The more distinctly geographical papers include one on the interesting subject "Geography and Geology," one on the "Physical Features of Scotland," and several on special regions of that country, such as the Cheviot Hills and the Outer Hebrides. Three essays of much wider scope show to the best advantage their author's powers of cautious generalisation and luminous exposition, the subjects being "The Geographical Evolution of Europe," "The Evolution of Climate" (involving the order of appearance of the continents), and "The Geographical Development of Coast-lines." The last-mentioned was the opening address of Section E of the British Association last year, and is printed in the *Proceedings*, vol. xiv., p. 639.

GENERAL.

Biography—Fischer. *Deutsche Rundschau* 15 (1893): 518-520. **Umlauf.**

Theobald Fischer, von F. Umlauf. With portrait.

Biography—Hartmann. *Deutsche Rundschau* 15 (1893): 471-473. **Wolkenhauer.**

Robert Hartmann, von W. Wolkenhauer.

Dr. Robert Hartmann, of whom a portrait is given, was Professor of Anatomy in the University of Berlin. He travelled in North-east Africa, and was the author of many contributions to anthropology. He died in April 1893.

Biography—Müller. *Deutsche Rundschau* 15 (1893): 469-471. **Umlauf.**

Friedrich Müller, von Friedrich Umlauf. With portrait.

Biography—Ratzel. *Deutsche Rundschau* 15 (1893): 423-425. ———

Friedrich Ratzel. With portrait.

Cabot. *B.S.G. Madrid* 34 (1893): 69-94. **Duro.**

Los Cabotos Juan y Sebastian, descubridores en el Continente americano. Por D. Cesareo Fernandez Duro.

Columbus. *Quarterly Review*, No. 353 (1893): 1-41. ———

The Discovery of America.

- Columbus.** *B. American G. S.* 25 (1893): 1-63. **Daly.**
Have we a Portrait of Columbus? Annual Address by Charles P. Daly, LL.D., President.
Judge Daly answers his question in the affirmative, and enters into a critical examination of the various portraits claiming to be authentic. He considers the Lotto portrait which the United States Government adopted for commemoration on coins and stamps as of doubtful authenticity. The paper is well illustrated.
- Education.** *National G. Mag. (Washington)* 4 (1893): 68-75. **Davis.**
The Improvement of Geographical Teaching, by Professor William Morris Davis.
- Geographical Names.** *B. S. Khélic. G.* (1893): 685-701. **Bonola.**
La Question des Noms Géographiques en Égypte, par F. Bonola Bey.
- Malaria.** *Scottish G. Mag.* 9 (1893): 281-302. **Clark.**
Remarks on Malaria and Acclimatisation. By H. Martyn Clark, M.D., of Amritsar.
- Mountaineering.** *B. G. Club, Philadelphia* 1 (1893): 1-32. **Balch.**
Mountain Exploration. By Edwin Swift Balch. *Illustrations.*
A vindication of the geographical importance of mountaineering.
- Place-Names.** *Ausland* 66 (1893): 465-471. **Egli.**
Der Völkergeist in den geographischen Namen. Von J. J. Egli (Zurich).
- Political Boundaries.** *M. Verh. Erbk. Leipzig* (1892): 1-54. **Förster.**
Zur Geographie der politischen Grenze mit besonderer Berücksichtigung curvimetrischer Berechnungen der sächsischen und Schweizerischen Grenze. Von Dr. Clemens Förster.
- Races.** **Pearson.**
National Life and Character. A Forecast, by Charles H. Pearson. London, Macmillan & Co., 1893: size 9 × 6, pp. 358. Price 10s.
Mr. Pearson, impressed with the geographical fact that the higher races only flourish in the temperate zone, while many of the lower races of mankind are cosmopolitan, endeavours to arrive, by reasoning, at the probable changes in national character likely to result in the near future.
- Tropical Hygiene.** *Ausland* 66 (1893): 449-451, 471-474. **Suero.**
Beitrag zur Hygiene in den Tropen mit Rücksicht auf die Arbeitsverhältnisse im Pflanzeleben auf Sumatra Von R. Suero (Deli auf Sumatra).
Practical observations on the health of workmen in tropical countries, especially with regard to the plantations of Sumatra.

NEW MAPS.

By J. COLES, *Map Curator, R.G.S.*

EUROPE.

England and Wales.

Ordnance Survey.

Publications issued since July 12th, 1893.

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Town Plans—10-foot scale:—

ENGLAND AND WALES: **Blackburn**, LXII. 12, 12, 3s.; 13, 4s.; 17, 4s.; 19, 5s.; 22, 4s.; 24, 5s.; LXII. 15, 18, 3s.; 19, 5s.; 20, 11s. 6d.; 23, 4s.; 24, 8s.; 25, 8s.; LXII. 16, 17, 8s.; 19, 8s.; 21, 8s.; 23, 8s. (coloured). **Sheffield** (Yorkshire). CCXCIV. 3, 6, 8, 16, 5s. each; CCXCIV. 4, 12, 5s.; CCXCIV. 6, 5, 4s.; CCXCIV. 8, 9, 5s.; CCXCIV. 15, 3, 4s.; CCXCV. 1, 7, 5s. This town is now complete. **Stockton-on-Tees** (Yorkshire), L. 12, 9, 4s.; 10, 3s.; 13, 4s.; 14, 5s.; 15, 5s.; 18, 5s.; 19, 8s.; 20, 5s.; 23, 8s.; 24, 11s. 6d.; 25, 5s.; L. 16, 2, 5s.; 3, 8s.; 4, 8s.; 5, 5s.; 6, 4s.; 7, 5s.; 8, 8s.; 9, 5s.; 10, 5s.; 11, 5s.; 12, 5s.; 13, 8s.; 14, 8s.; 15, 8s.; 17, 5s.; 18, 5s.; 19, 5s.; 20, 11s. 6d.; 24, 5s.; 25, 5s.; LI. 9, 11, 3s.; 16, 4s.; 21, 3s.; LI. 13, 11, 3s.; 16, 5s.; 21, 5s. This town is now complete in 37 sheets (coloured). **Withington** (Lancashire), CXI. 6, 15, 4s.; 19, 5s.; 20, 5s.; 24, 5s.; CXI. 7, 3, 5s.; 6, 5s.; 12, 4s.; 16, 5s.; 21, 4s.; CXI. 10, 10, 5s.; CXI. 11. 1, 3s.; 6, 5s.; 11, 8s.; 21, 5s.; 22, 5s. (coloured).

(E. Stanford, Agent.)

England.**Bartholomew.**

Plan of Bournemouth with Environs. Scale 490 yards to an inch. *Price 2s.*
Map of Keswick, Ullswater, &c. Scale 1 : 63,360, or one statute mile to an inch. By J. Bartholomew. London, W. H. Smith & Son. *Price 1s.*
Presented by the Author.

Europe.**Bartholomew.**

The Tourist's Atlas-Guide to the Continent of Europe. A series of section maps and plans, with notes for travellers, by J. G. Bartholomew, F.R.G.S. London, George Philip & Son, 1893. *Price 5s.* *Presented by the Publishers.*

In addition to numerous maps and plans, this little atlas contains useful notes as to hotels, objects of interest, &c. These latter are necessarily very brief and general, and it is questionable if too much has not been attempted within the limited space afforded by so small an atlas.

Russia.**Comité Géologique, St. Petersburg.**

Carte Géologique de la Russie d'Europe éditée par le Comité Géologique a l'Institut des Mines, St. Pétersbourg, 1892. Scale 1 : 520,000, or 8·2 statute miles to an inch. Par A. Karpinsky, S. Nikitin, Th. Tschernyshev, N. Sokolov, A. Mikhalsky, etc. With explanatory text. *Price 7 roubles.* *Presented by the Comité Géologique, St. Petersburg.*

Previous to the appearance of this geological map of European Russia, the only one, on a scale large enough to be of any practical service, was that which was

prepared by Sir Roderick Murchison in 1845, of which several editions have since been published. The present map has been issued by the Geological Committee of the Institute of Mines, St. Petersburg, and is published by them in commemoration of the tenth year of the existence of the Committee. The important work of compilation was entrusted to MM. A. Karpinsky, S. Nikitin, T. Tschernyshev, N. Sokolov, and A. Mikhalsky. The colours in which the map is printed are well chosen. A full explanation of their signification is given of these, which, as well as the lettering of the map, is in Russian character. The map is, however, accompanied by a pamphlet in French, which contains full explanatory notes.

Servia.**Servian General Staff.**

General-Karte des Königreiches Serbien. Scale 1 : 200,000, or 2·7 geographical miles to an inch. Bearbeitet und herausgegeben vom kgl. Serbischen grossen Generalstabe. 9 grosse Blätter u. 8 Klappen mit Plan von Belgrad 1 : 50,000, or 1·4 inch to a geographical mile. Belgrad 1893. In Commission bei Artaria & Co. in Wien. *Price 25 marks.*

This is a nine-sheet map of Servia. It is printed in colours; the areas covered with forests are shown in green, the hill-shading in brown, water in blue, and the main roads in red. In addition to the principal map, there is a plan of Belgrade, and the title-page contains a table showing the administrative divisions, and an explanation of the signs and colouring used in the map. The lettering is in Russian character.

Spain.**Instituto Geográfico y Estadístico Madrid.**

Mapa Topográfico de España en escala de 1 : 50,000 or 1·26 inches to a stat. mile. Comienza su publicación el Instituto Geográfico y Estadístico, bajo la dirección del Excmo. Señor Don Carlos Ibañez de Ibañez de Ibero, Director General, con el concurso de Jefes y oficiales de Artillería, Ingenieros y Estado Mayor, Astrónomos, Ingenieros de Caminos, Canales y Puertos, de Minas y de Montes, Cuerpo of Topógrafos y Auxiliares de Geodesia. Madrid, 1892-93. Sheet No. 766. Valdegauga, Provincia de Albacete. 790, Albacete. 816, Peñas de San Pedro, Provincia de Albacete.

ASIA.**Siam.****Johnston.**

Map to illustrate the Siamese Question showing the present limits of French Claims, and the additional Territory now demanded, July 1893. Scale 1 : 6,000,000, or 94·7 stat. miles to an inch. With insets of the World on Mercator's Projection, and Asia. W. & A. K. Johnston, Edinburgh and London. *Price 6d. Presented by the Publishers.*

AFRICA.**East Central Africa.****Höhnel.**

Provisorische Original-Karte der Expedition Wm. Astor Chanler's vom Tana-Fluss zum Guasso-Njiru. Aufgenommen u. gezeichnet von L. R. v. Höhnel K. u. K. Linienschiffs-Lieutenant. Scale 1 : 500,000, or 7·8 stat. miles to an inch. *Petermann's Geographische Mittheilungen.* Jahrgang, 1893. Tafel 9. Gotha, Justus Perthes. *Presented by the Publisher.*

AMERICA.**Argentine Republic.****Brackebusch.**

Höhenschichten-Karte des nordwestlichen Theiles der Argentinischen Republik, von Prof. Dr. Ludwig Brackebusch. Scale 1 : 3,000,000, or 47·8 stat. miles to an inch. Physiographische Karte des nordwestlichen Theiles der Argentinischen Republik, von Prof. Dr. Ludwig Brackebusch. Scale 1 : 3,000,000, or 47·8 stat. miles to an inch. *Petermann's Geographische Mittheilungen.* Jahrgang, 1893. Taf. 10 u. 11. Gotha, Justus Perthes. *Presented by the Publisher.*

British Columbia.**Chief Commissioner of Lands and Works, B.C.**

Map of the South-Western part of British Columbia. Compiled by direction of the Honourable F. G. Vernon, Chief Commissioner of Lands

and Works. Victoria, B.C., 1892. Scale 1 : 750,000 or 11·8 statute miles to an inch. (*Stanford.*)

On this map the boundaries of the several districts of the south-western portion of British Columbia are shown, and all existing means of communication are laid down. With the exceptions of Mount Baker in the State of Washington, and Crown Mount in the Nootka District of Vancouver's Island, there is no hill-shading. In the New Westminster district, on the mainland, the survey sections on either side of the Fraser River are shown, and also in the northern portion of Vancouver's Island. The map is printed in colours, but in the absence of hill-shading it fails to convey an accurate idea of the mountainous character of the country.

GENERAL.

Historical Geography.

Schrader.

Atlas de Géographie Historique. Ouvrage contenant 54 grandes Cartes doubles en couleurs, accompagnées d'un Texte Historique au dos et d'un grand nombre de Cartes de Détail, Figures, Diagrammes, etc. Par une Réunion de Professeurs et de Savants, sous la direction géographique de F. Schrader, directeur des travaux cartographiques de la librairie Hachette et C^{ie}. *Price of each part 1 fr. 50 centimes.* Paris, Hachette et C^{ie}, 1893.

This is the first issue of a new historical atlas which is being compiled under the direction of Monsieur F. Schrader, director of the cartographical works of Hachette & Co., Paris. After the issue of the second part, which will appear in October, one will be published every month until it is completed. Part I. contains a map of Greece in the time of Pericles, the world at the epoch of the great discoveries, Europe from 1715 to 1893. The maps are very nicely drawn, and several insets are given. On the back of the maps there are copious historical notes, which add considerably to their value. If this part may be taken as a fair specimen of those that are to follow, it will, when complete, be a very useful and carefully executed atlas.

The World.

Johnston.

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Part 22. W. & A. K. Johnston. Edinburgh and London. *Price 4s. 6d. each. Presented by the Publishers.*

Sheet 36 is a map of Oceania, containing insets of Western Australia, Tasmania, Fiji Islands, and Eastern extremity of New Guinea. Sheet 43 is a map of Egypt, Arabia Petraea, and Lower Nubia, with insets of Cairo, Alexandria, and the Suez Canal. Special pains appears to have been taken to bring the maps up to date, and, as usual with this atlas, each map is accompanied by an index.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty. May and June, 1893. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
1684 m = 4·0		Mediterranean, Thaso Island:—Panagia Road. 1s. 6d.
1880 { m = 6·0 } { m = 12·0 }		Mediterranean, Gulf of Xeres:—Suvla Bay, Arapos. Mermedia Bay. 1s. 6d.
1932 { m = 3·0 } { m = 4·9 }		Newfoundland, east coast:—Orange Bay. Head of Piggonnière Arm. 1s. 6d.
299 m = 4·3		Newfoundland, west coast:—Currant Island to Bird Cove. 2s. 6d.
1731 m = 1·5		Canada, Lake Huron:—Parry Sound and Approaches. 3s. 6d.
479 m = various.		West Indies. Anchorages in Puerto Rico:—Mona Island. Aguadilla Bay. Puerto de Guanica. Mayaguez Bay. Port Ponce. (<i>Re-published.</i>) 1s. 6d.
1792 m = 3·0		North America, west coast, Admiralty Inlet:—Port Townsend and Kilisno Harbour. 1s. 6d.

No.	Inches.	
7	$\left\{ \begin{array}{l} m = 1.0 \\ m = 10.0 \end{array} \right\}$	Gulf of Aden:—Aden and adjacent bays. Aden Anchorage. (<i>Re-published.</i>) 2s. 6d.
1798	m = 0.75	China, north coast:—Kwang tung Peninsula, showing approaches to Port Arthur. 1s 6d.
1716	m = 0.4	Australia, north-west coast:—Jones Island to Cape Voltaire, including the Holothuria Banks. 2s. 6d.
1963	m = 0.4	British New Guinea:—Kiriwina or Trobriand Islands. 1s.
1579	m = 1.0	South Pacific, New Hebrides Islands:—Malepula Island, southern part. 2s 6d.
2701	— — —	Gulf of Cattaro to Corfu:—New plan. Port Otranto.
1454	— — —	Pribiloff Islands:—Plan added, English Bay.
724	— — —	Islands and reefs between Seychelles and Madagascar:—New plan, Bird Island. Plan added, Dennis Island.

(*J. D. Potter, Agent.*)

CHARTS CANCELLED.

No.		Cancelled by—	No.
299	Old Férolle Harbour and Brig Bay ..	New plan. Current Island to Bird Cove	299
660	Ste. Geneviève Bay ..	New plan. Current Island to Bird Cove	299
479	Anchorage in Puerto Rico Island	New plans. Anchorages in Puerto Rico Island	479
500	Port Ponce	New plans. Anchorages in Puerto Rico Island	479
7	Aden and adjacent bays	New plan. Aden and adjacent bays	7

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS:

No. 915, Wales, Milford Haven:—Pembroke Reach. 2306, Norway, west coast:—Rømdals Islands to Hitteren Island. 2307, Norway, west coast:—Smølen to Sve Fiord. 2295, Norway, west coast:—Trondhjem Bay, Orland Bay. 2308, Norway, west coast:—Brand Fiord to Lekö. 2309, Norway, west coast:—Lekö to Donnæso. 2643, France, west coast:—Raz de Sein to Goulven. 2235, Black Sea:—Anakria Fort to Kertch Strait. 2205, Black Sea, Kertch Strait. 2733, Iceland: Portland to Sneffells Jökul. 305, Gulf of St. Lawrence:—Lake Island to Pashasheeboo Point. 1621, North America, east coast:—Entrance to the River St. Lawrence. 266, North America, east coast:—Great Egg Harbour to Albemarle Sound. 355a, 355b, North America, east coast:—Chesapeake Bay (2 sheets). 395, West Indies:—Los Roques to Cape La Vela. 2431, North America, west coast:—Port Simpson to Cross Sound. 2689, North America, west coast:—Haro and Rosario Straits. 2840, North America, west coast:—Haro Strait and Middle Channel. 579, North America, west coast:—Fraser River to north-east point of Texada Island. 1822, Borneo:—Sarawak River. 2636, Eastern Archipelago:—Strait of Makassar, north part. 2662, Eastern Archipelago:—Ports in Makassar Strait. 2764, Australia, east coast:—Coral Sea and Great Barrier Reefs. 2122, Australia, north coast:—Torres Strait, north-east and east entrances. 2423, Papua of New Guinea:—Boigu Island to Cape Blackwood. (*J. D. Potter, Agent.*)

French Charts.

Service Hydrographique de la Marine, Paris.

No. 4735, Atterrages de Brest, France, 1893, 2 fr.—4385, Saint-Malo et Saint-Servan, Embouchure de la Rance, Côte Nord de France, 1892, 2 fr.—4665, Baie de Nhatrang et ses Environs, Hon Lon, Cua Bé &c., Côte d'Annam, Mer de Chine, 1893, 2 fr.—4600, Estuaire du Gabon Côte Ouest d'Afrique, 1892, 2 fr.—4600, Estuaire du Gabon, Côte Ouest d'Afrique, 1892, 2 fr.—4738, Estuaire du Gabon, Congo Français, 1893, 1 fr.—4723, Entrée de la Rivière Benito, Congo Français, 1893, 1 fr.—4782, Croquis de la Rivière Benito, Congo Français, 1893, 1 fr.—4715, Baie de St. Augustin. Côte S. O. de Madagascar, 1893, 2 fr.—4696, Baie de Diego-Suarez, Côte N.E. de Madagascar, 1893, 2 fr.—4734, Mouillage de Nosy Andrahombava, Mouillage de Nosy Hao, Baie Tsingiloilo, Côte Ouest de Madagascar (Cap St. Vincent) 1893, 1 fr.—4733 Cap St. Vincent

de la Baie Fanemotra à la Baie Tsingilofilo. Côte Ouest de Madagascar, 1893, 1 fr.—4767, Iles Barren et Atterrages de Maintirano, Côte Ouest de Madagascar 1893, 1 fr.—4716, Baie aux Lievras, Côte N.E. de Terre-Neuve, 1893, 2 fr.—4732, Baie San Miguel, embouchure du Fleuve Darien, Amérique du Sud, Côte Ouest, 1893, 1 fr.—*Presented by Service Hydrographique de la Marine, Paris.*

Indian Ocean.**Koninklijk Nederlandsch Meteorologisch Instituut.**

Waarnemingen in den Indischen Oceaan over de Maanden Maart, April en Mai. Koninklijk Nederlandsch Meteorologisch Instituut. Utrecht, 1893. J. Van Druten. Verkrijgbaar bij H. G. Bom, Teevaartkundige Boekhandel. *Price* 5.50 fl.

This atlas has been compiled from a vast number of observations by the Koninklijk Nederlandsch Meteorologisch Instituut. The charts in the present part exhibit the meteorological conditions of the Indian Ocean during the months of March, April and May. Charts I., II., III. show the surface temperature of the water; IV. to IX. the currents; X., XI., XII., isobars; XIII., XIV., XV. temperature of the air; XVI., XVII., XVIII., the winds; XIX., XX., XXI. the rainfall, fogs, hurricanes, and hail; XXII., the mean state of the clouds; XXIII., the routes and limits of whales, flying-fishes, albatros, ice, drift-wood, and eddies; XXVI. tempests and the courses of cyclones. The charts have evidently been compiled with great care, and are accompanied by explanatory notes in French and Dutch; these might with advantage be extended.

Isle of Wight and Solent.**West and Collins.**

19 Charts of the Isle of Wight and Solent Tides, from Portland Bill to the Owers. By T. B. C. West and F. Howard Collins. London: J. D. Potter, 1893. *Price* 7s. 6d. *Presented by the Publisher.*

This series of charts is intended to represent, in a graphic form, the direction of the tidal streams from Portland Bill round both sides of the Isle of Wight to the Owers. The charts represent the state of the tide and the direction in which it runs at half-hourly intervals after and before high water. They have been engraved from the Admiralty chart, the arrows being placed in accordance with the information contained in the 'Channel Pilot,' published by the Hydrographic Office. The period embraced in the accompanying tide-tables is from May to October 1893; they are therefore each suited to meet the requirements of yachtsmen.

North Atlantic Ocean.**U.S. Hydrographic Office.**

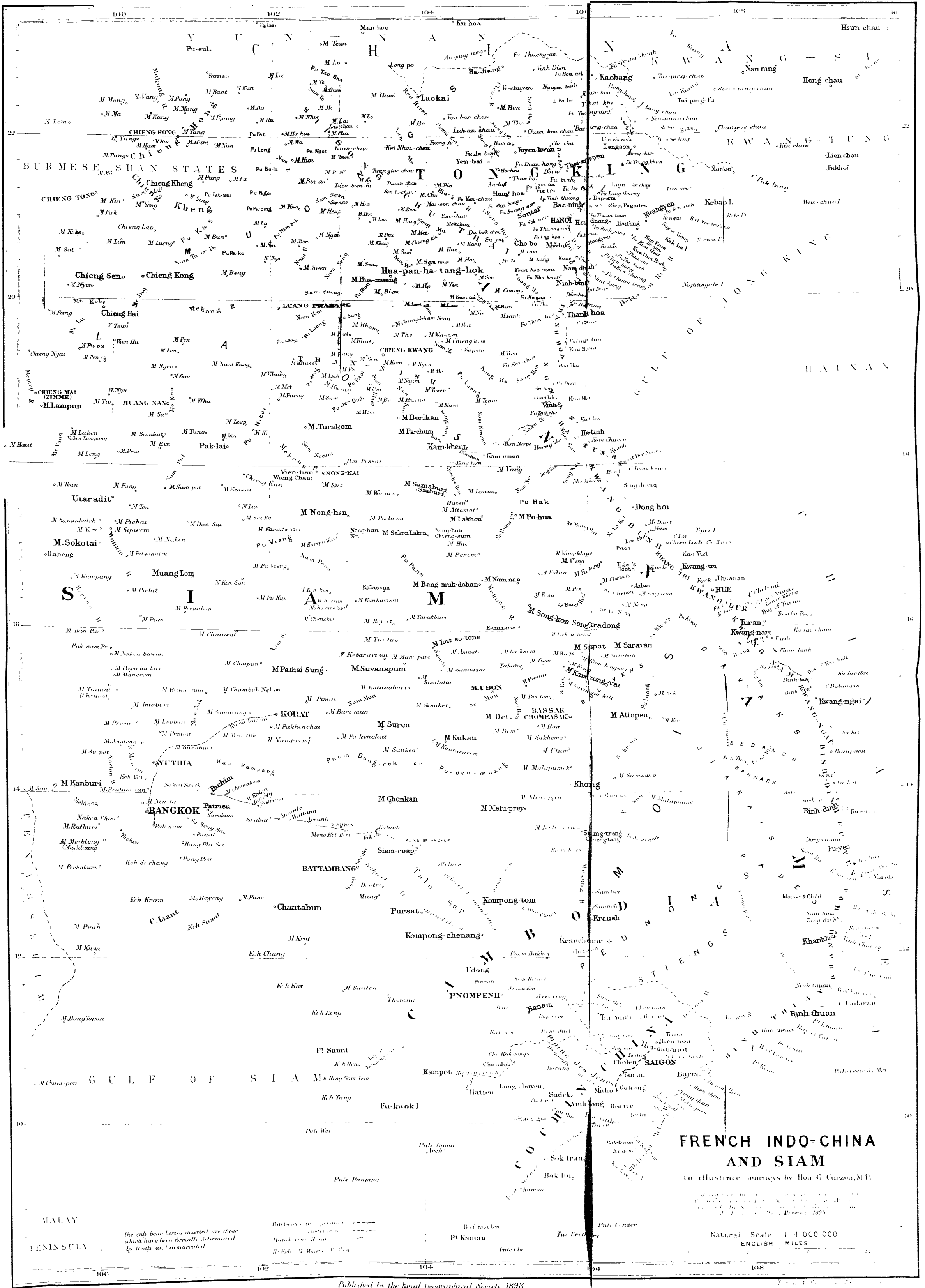
Pilot charts of the North Atlantic Ocean for June, July, and August, 1893. Published at the Hydrographic Office, Bureau of Navigation, Navy Department, Washington, D.C. Charles D. Sigsbee, Commander U.S. Navy, Hydrographer. *Presented by the U.S. Hydrographic Office.*

Portuguese Charts.**Commissão de Cartographia, Lisbon.**

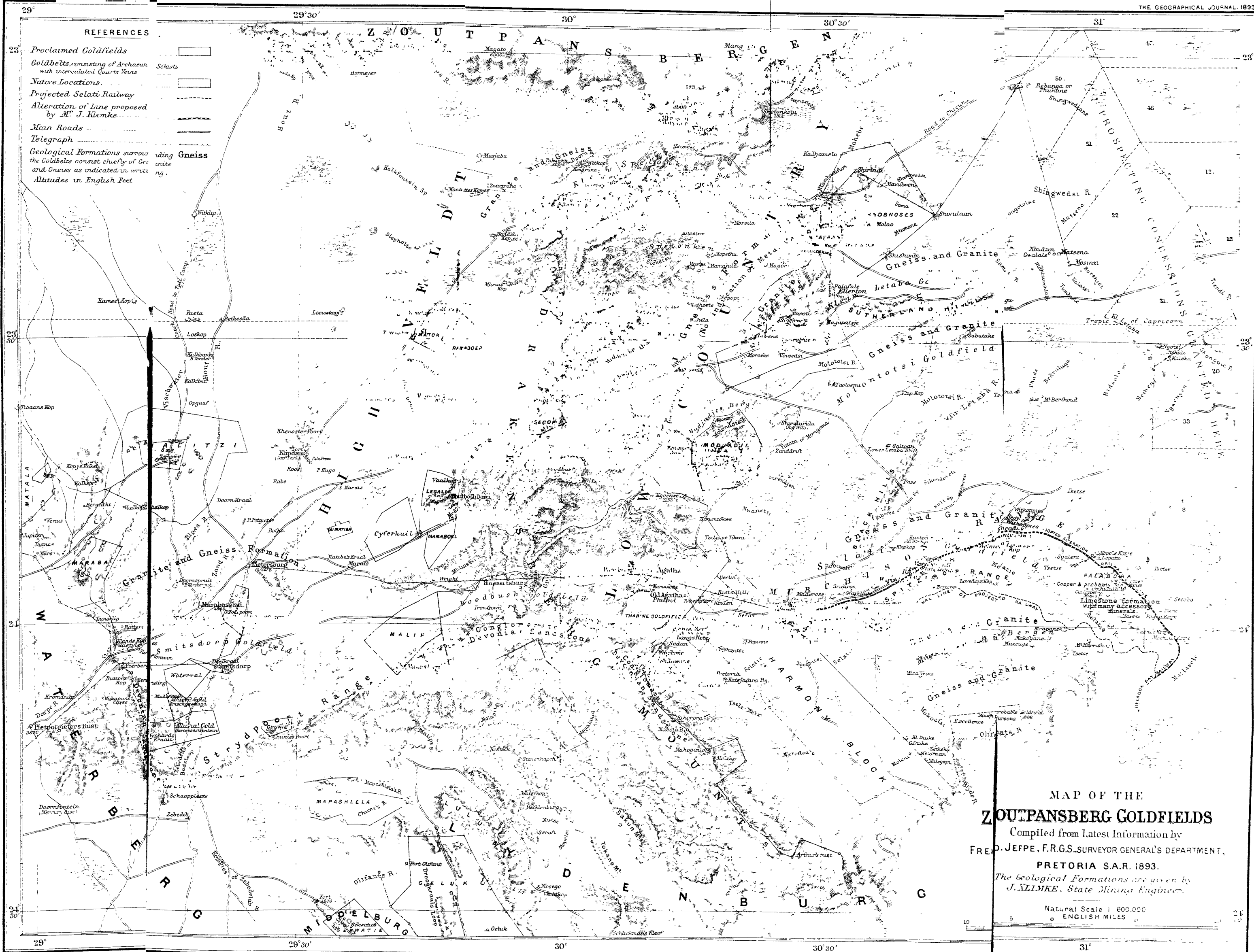
Planta hydrographica da Barra de Quelimane. Provincia de Moçambique. Scale 1:50,000, or 1.26 inches to a statute mile. Levantado em Dezembro e Janeiro de 1891-1892 pelo 2º tenente J. D. Leotte de Rego.—Plano hydrographico da Barra e Cruso do Rio Macuse, até 25 milhas da costa. Levantado de Maio a Julho de 1892 por J. D. Leotte do Rego 2º tenente da armada. Scale 1:109,612, or 1.7 stat. miles to an inch. Ministerio da Marinha e Ultramar, Commissão de Cartographia, Lisbon. *Presented by the Commissão de Cartographia, Lisbon.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.







ZOUTPANSBERG GOLDFIELDS
 Compiled from Latest Information by
 FRED. JEPPE, F.R.G.S., SURVEYOR GENERAL'S DEPARTMENT,
 PRETORIA S.A.R. 1893.
*The Geological Formations are given by
 J. ALMKE, State Mining Engineer.*



four admirable Gurkha sepoy's whom he brought with him. The sketches painted by Mr. McCormick (a few of which are now exhibited) speak for themselves. He worked with greatest constancy under the worst conditions, and was throughout my most loyal friend. Zurbriggen acquitted himself well of the task he undertook, and proved to be the only really satisfactory travelling guide yet discovered. To Mr. J. H. Roubush's energy whilst he was with us we were also not a little indebted.

The Government of India by giving us permission to visit the Hunza district made our journey possible; by allowing Mr. Bruce and the four Gurkhas to accompany me they gave me notable help. Alike at Abbottabad, Srinagar, Gilgit, Hunza, and Leh we were warmly received by the authorities, English and native. Where all were so kind it is almost invidious to mention names; but I cannot in this connection avoid returning especial thanks to Colonel Durand, Dr. Robertson, and Surgeon-Captain Roberts of the Gilgit Residency.

The only previous explorers of the Mustagh Range to whom I need refer are the two I have mentioned. Colonel Godwin-Austen spent the summers of the years 1860 and 1861 in making the Government map of the southern side of the main range. That was at a time before the Matterhorn had been ascended and before the difficult craft of mountaineering had been fully developed. Indifferently equipped (from a mountaineer's point of view), he penetrated these regions, previously almost unknown, discovered the third of the three great glaciers, and set down the form of their watersheds and the nature of their basins. Had he been permitted to advance to the upper levels of the Baltoro and Biafo Glaciers he would no doubt have rendered my journey unnecessary. I am selfishly glad he did not do so; but, at the same time, I cannot help calling upon you to remember the admirable work that he accomplished, in the face of great difficulties and at a time when the moral repulsion and terror of high mountain regions was incomparably greater than it is now.*

Captain Younghusband's famous passage of the Mustagh Pass, which bears to the Baltoro Glacier the relation borne by the Nushik La to the Hispar Glacier, is fresher in the memory of you all.† It likewise was a great feat, considering the circumstances under which it was performed. The purely mountaineering difficulties encountered were few, but they had to be overcome by a caravan of untrained coolies, who look upon snow not as the natural highway it appears to us, but much as a landsman regards the sea.

I need not delay over any of the earlier stages of our journey. We left Srinagar on the evening of April 1st, 1892, and, following the

* *Journal*, R.G.S., 1864.

† *Proceedings*, R.G.S., 1885.

new Gilgit road, which was almost everywhere buried under snow or avalanches, we crossed the Tragbal Pass. The Burzil Pass delayed us for a few days, as the weather became bad and snow fell almost continuously. Ultimately on April 24th we crossed it in sufficiently evil weather, and thus passed over to the north side of the main Himalayan Range and entered the basin of the Indus. We descended past Astor to the river's banks at Bunji. South of the Himalayan Range the valleys are, on the whole, fertile and the scenery rich. North of it the country is a mere crumpled Sahara. The Indus in its upper course flows through a desert, walled about by barren cliffs of appalling altitude and steepness. Almost the only fertile spots are the oases, few and far between, where the waters of minor streamlets, fed from the snows far aloft, are caught and distributed by artificial canals over a small area of levelled fields. I must ask you to bear this general character of the scenery in mind. The sun beats down into these barren and enclosed valleys with great power. The ground, whether of soft sand or broken stones, is painful and wearisome to the feet. It is a laborious region to march through.

We crossed the Indus near Bunji, and then, following the right bank of a tributary which enters it from the west, we reached Gilgit. The Gilgit Valley may be taken as an example of the action of an agent which I think has not received from geographers and geologists the attention it demands—I refer to the “mud avalanche.” The form of the valley at most points is as follows:—Its sides consist of bare rocky slopes and cliffs, the lower parts of which are buried beneath accumulations of *débris* consisting of stones, as often rounded as angular, embedded in mud. This accumulation of *débris* fills up the valley to a depth of probably from 500 to 1000 feet or more. The Gilgit River flows in a gorge, like a cañon, not so much cut through as built up by this accumulation. The surface of the *débris* has a gentle slope of about 3°. If the valley were filled up in this fashion to a depth of 2000 or 3000 feet more, it would resemble the Pamirs and all the deeply-filled valleys which are characteristic of the Central Asian plateau, from the middle of Tibet on the east to the upper regions of the Oxus on the west. Mud avalanches, I maintain, have done all this work of filling up the valleys, and done it too with great rapidity. The day before we reached the foot of the Hispar Glacier I was fortunate enough to see one of these avalanches falling. I will read you an extract from my journal written on the spot (July 8th): “We were just approaching the mouth of a deep, narrow nala that crossed our path when we heard a noise as of continuous thunder, and beheld a vast black wave advancing down it at a rapid pace. Some accumulation of water had got loose high aloft, and the flood was bringing the hill down with it. When we reached the edge of the nala the main mass of the stuff had gone by and only a thick, black stream of mud was rushing swiftly past. This became by

degrees more liquid until it was no longer mud but black water. We waited for some time till the waters subsided. At length Harkbir found a way across the torrent by leaping from stone to stone. We had begun to follow him when Karbir, who was looking up the nala, shouted to us to come back, which we did with the nimblest feet. We were not more than out of the ditch before another huge mud avalanche came sweeping down. It was a horrid sight. The weight of the mud carried huge masses of rock down the gully, rolling them over and over like so many pebbles, and they in turn dammed back the muddy torrent and kept it moving slowly with accumulating volume. Each of the big rocks that formed the vanguard of this avalanche weighed many tons; the largest were about 10 foot cubes. The stuff that followed them filled the nala to a width of about 40 feet and a depth of about 15 feet. The thing moved down at a rate of about 5 miles an hour. When the front of the avalanche was gone, and the mass of stuff became shallower, the mixture was about half mud, half rocks, and flowed faster. Now and again a bigger rock than the average would bar the way; the mud would pile up behind it and presently sweep it on. Looking up the nala we could see the sides of it constantly falling in and their ruins carried down. Three times did the nala yield a frightful offspring of this kind, and each time it found a new exit into the main river below, and entirely changed the shape of the fan. The third avalanche was the largest of all, and fortunately left a massive causeway of stones, reaching almost across the nala at our very feet. Some big fall must presently have taken place higher up and dammed back the waters, for the stream ran almost dry, and we were enabled to cross the gully without difficulty, coolies and all."

It must be remembered that this fall took place into a gorge. Had it happened in an opener part of the valley the avalanches would have spread about all over the floor. Every gully we crossed, about that time of year, showed the clear signs of having been swept by a similar discharge, and the same was the case later on, where we came upon dried-up traces of mud avalanches in all the gullies that feed the Braldu River near Askole.

Mountaineers know that, early in every year, all the main gullies of every region of snow-mountains discharge, each one, a snow avalanche into the depths below. Similarly, in the desert ranges of Asia, mud avalanches appear to be annually discharged by all the gullies which reach up to the snow region and traverse the barren levels beneath. Rapid aerial denudation, the extraordinary activity of which has been observed by all travellers in the desert belt of the world, annually provides the materials for these discharges. Assuming that one of the avalanches we saw travelled at the rate of only 7 miles an hour (= say 200 yards a minute), and took only seven minutes to pass any point, it would be 1400 yards long. Call its average width

only 8 yards, and its average greatest depth only 2 yards, it would consist of over 10,000 cubic yards of stuff. Suppose three-fourths of this to have been water, you get 2500 cubic yards of *débris* discharged by one of these avalanches, and we saw three come down a single gully, where others had fallen before we arrived and others fell after we left; 15,000 cubic yards is a low estimate (I believe 50,000 would not be an over-estimate) for the fall of that one day down that single and relatively small gully. One gully of this sort to every mile of a valley is a minimum computation, taking both sides into account. You will see, therefore, what a powerful element mud avalanches must be in determining the physical features of this region of the Earth.

Arrived at Gilgit we found the condition of the mountains, from a climber's point of view, too backward for our purposes. We therefore spent a month in mapping and exploring the fine Bagrot Valley, which slopes southwards from Rakipushi and his immediate neighbours along the main ridge. We hoped to be able to force a passage over this ridge into Nagyr; but persistent bad weather balked our efforts when they were on the point of succeeding. I shall not further linger over this portion of our journey except to say that, for richness of wooded foreground and pleasant grassy slopes, the Bagrot Valley was the only one we visited which can compare—not in dignity, but in charm—with the rich valleys of the Alps.

We returned to Gilgit and set forward on June 8th for the secluded and rock-bound valley of Hunza-Nagyr, which had been effectively brought within the boundaries of the British Empire by the gallant expedition of the preceding December. Hunza is the name of the principality on the north bank of the Hunza River, Nagyr the name of that which faces it from the south bank up to the parting of the streams, where Nagyr has a river of its own, fed by the melting of the Hispar and other great glaciers of the region surveyed by me. These little principalities have been so admirably described by Mr. E. F. Knight in his recently-published book, entitled, 'Where Three Empires Meet,' that I am absolved from doing more than referring you to the pages of that work for information. I can assure you it is well worth reading. Mr. Knight, however, only saw this remarkable valley in the winter; it is imperative, therefore, that I at least allude to its astounding magnificence in kinder seasons of the year. When the traveller has emerged from the inhospitable defiles which sunder it from Gilgit, and has climbed the vast ancient moraines near Tashot, which form the final rampart of the fertile basin (fertile, of course, only by reason of artificial irrigation of admirable complexity and completeness), he stands surrounded by an astonishing view. The bottom of the valley is, as usual, deeply filled by *débris*, whose surface is covered by terraced fields, faced with cyclopean masonry, and rich with growing crops and countless fruit-trees. The mountains fling themselves aloft on either

hand with astounding precipitancy, as it were, into the uttermost heights of heaven; so steeply, in fact, that a spring avalanche falling from the summit of Rakipushi on the south must almost reach the bottom of the valley, whilst I myself saw within a short distance of the houses of Hunza town (Baltit) the snowy dust of a great avalanche, which descended grandly from near the top of the noble peak that rises close behind the place. Rakipushi is 25,500 feet high; the Hunza peak is about 24,000 feet high. Their summits are separated by a distance of 19 miles. Both mountains are visible from base to summit at one and the same time from the level floor of the valley between them, which is not more than 7000 feet above the sea. No mountain view that I saw in the Mustagh surpasses this for grim wonder of colossal scale, combined with savage grandeur of form and contrast of smiling foreground.

I have not yet been able to discover exactly what area of the Hindu Kush is covered by the name Karakoram or Mustagh. The name is generally written on maps in a more or less northerly and southerly direction, but there is no range that lies in that line. All the ranges of this region of the world lie in parallel lines one behind another, running from somewhat south of east to somewhat north of west. One such range stretches from Rakipushi all along the south side of the Hispar Valley as far as the Hispar Pass; a second, north of it, forms the north bank of the Hispar Valley, and includes the great Hunza Peak. Yet a third further north is unsurveyed; it separates the upper region of Hunza, called Gujal, from the Taghdumbash Pamir. The Hunza River rises in this range and flows at first southwards. It cuts through what I may call the Hunza Range, and then joining the Nagyr River, the two flow westwards in a united stream, which, after passing Rakipushi, turns south again, cuts through the Rakipushi Range, and joins the Gilgit River near Gilgit. The Gilgit River flows about east till it joins the Indus, which in its turn, now flowing somewhat west of south, cuts through the main Himalaya Range in the recently-pacified country of Chilas. It is a remarkable fact that each of these rivers cuts through its range close to one of the very highest elevations and apparently at one of the most unpromising points—the Hunza River, near the Hunza Peak, the united Hunza-Nagyr River near Rakipushi, the Indus River near mighty Nanga Parbat. These successive cuttings, forming a continuous series of valleys, and leading ultimately to a group of relatively low passes, point to the Hunza route as the natural line of communication, in the possibly distant future, between the Central Asian plateau and the southern seas.

We spent the month from June 10th to July 10th in either Hunza or Nagyr, at points between Chalt and Hispar. During that time we were only able to make two at all considerable climbs, for the weather was continually bad, and frustrated all my attempts. This evil condition of

the weather was my greatest disappointment, for though the mountains about the Baltoro Glacier were famous for frequent storms, we had been led to believe that the neighbourhood of Gilgit was a centre of almost unvarying fine weather during the hot season. The commonly-received theory is that the south-west monsoon drops all its moisture upon the southern slopes and main crest of the Himalayas, and passes dry over the desert area beyond. This is far from being the case, at all events at the west end of the range. The average altitude of the Himalayas in Kashmir, is, I believe, not above 19,000 feet. It is probably the case that the lower levels of the air current are dried up to a considerable altitude; but there is plenty of aqueous vapour left higher up. It is a common experience in the Alps that mountaineers are found complaining of continuous bad weather, whilst valley travellers are boasting of their good luck. The damp air only discharges its moisture in the immediate neighbourhood of snowy peaks. When drifting over valleys the clouds melt away and the blue sky appears. Thus, too, it is all over the Upper Indus Valley and its tributaries. The sun pours down into their depths through a cloudless heaven, but the snowy mountains are all the time draped in heavy clouds, and deep falls of snow are constantly taking place upon them. For seven days out of eight during the summer season there was a steady aerial drift passing over our heads from the south-west or south-south-west. Now and again for a day, or possibly two days, a strong gale would blow from the north and make the sky perfectly clear, but the south-westerly drift would soon return. It was not always snowing when the south-west wind blew; two or three days would now and again be clear; then a faint fleck of cirrus would appear: it would not long remain solitary: bright battalions of tiny cloudlets would soon be passing overhead. Gradually they melted together into a flat roof of mist lying at an altitude of from 20,000 to 24,000 feet, through which the sun would shine with an added venom of heat. This film would in time condense into clouds, and others would simultaneously form upon the upper crests, and the conditions would gradually worsen till snow was falling heavily down to a comparatively low level. After two or three days, or perhaps a week, there would set in a leisurely improvement, and a brief spell of fine weather would again intervene. This kind of thing lasted throughout the months of May, June, July and August. The first part of September brought the worst weather of all, after which the sky permanently cleared, but too late to be of any service to mountaineers, for with the fine weather terrible cold reigned aloft, coupled with strong winds and short days.

Having been beaten back on June 24th from an attempt to reach the Bagrot Pass from the north, we returned to Nagyr, and started inwards towards the wholly-unknown region. We heard that there was a large cultivated basin, called Hopar, that lay on our way; but we could not understand how it was situated. We left Nagyr behind on June 27th.

and in a mile or two came to the foot of the Hopar Glacier. This glacier was once joined by the Hispar Glacier, and their united moraines were deposited at Nagyr, the town being actually built upon their crest. Now the foot of the Hispar Glacier has retreated some 20 miles into the mountains. The Hopar Glacier is greatly shrunken in width, and in its shrinkage it has left a fine, almost level area beside its left bank, which is covered by the fields of Hopar. Hopar consists of six flourishing little villages. It is surrounded on two sides by glacier, and on the third by steep hills. Close to it the glacier divides into two considerable branches, one flowing from the south, the other from the east. We advanced up the latter, which is called the Barpu Glacier, and made a camp at the picturesque alp of Barpu, whither the Raja of Nagyr sends his horses to graze.

We were delighted to find an enormous and almost unsuspected series of glacier basins above Barpu. In order to get some idea of them, we spent a day mounting to the crest of the ridge north of our camp which divides Barpu from the Hispar Valley. From the crest of this ridge we looked southwards, straight up a noble stream of ice, descending from the 24,000 feet peak, which stands on the main watershed. This branch of the Barpu Glacier is called Shallihuru Glacier. Another main branch descended towards us from a set of great peaks to the east, situated at the head of the Chogo Loomba Glacier. One of the peaks at the head of the Shallihuru Glacier invited attack, and so we mounted towards it during two days. For a long distance the ice descends in a continuous ice-fall. We fought our way almost to the top of this, but were at last beaten by a narrow belt of shattered ice, over which we could throw a stone, but through which we could not force a way. We worked at this detail for six hours without success, and then had to give it up, and content ourselves with ascending a minor peak on our right hand. The following day we retraced our steps to the foot of the ridge that divides the Barpu and Hispar valleys. Next day (July 7th) we crossed this ridge, sending the coolies in charge of Mr. Rondebush by a lower pass, whilst the rest of us crossed higher up by a col that just reached the snow-level at a height of about 16,000 feet. On this occasion we were blessed with superb weather, and we were in the midst of superb scenery. As we mounted the view developed; the great glacier basins below revealed their distant recesses, and the cirque of giant peaks behind, all white with *nevé*, reared themselves aloft against the blue sky and showed the smallness of their outlying satellites, which had seemed to rise so high above us from our camps. The sun blazed upon us with unusual fury, and when we reached the col, near which there was a frozen lake, caught in the lap of the ridge, we were glad to hurry under the shadow of a great rock. The view on the other side was of peculiar interest to us, for we looked for the first time into the Hispar Valley and beheld the long avenue of peaks that

lined the way up the Hispar Glacier towards the unknown snowy regions through which lay our intended route into Baltistan. Turning to our left and looking down the valley the Hunza Mountain and his neighbours still saluted us, majestic in form as ever. When the sun began lowering in the west all the sky was filled with mellow light, wherein the snowy ranges seemed almost to hang suspended. We turned unwillingly to descend. The form of the hillside fortunately drove us down westwards towards the sunset, and, just as night came on and one bright star looked out over the shoulder of the Hunza Peak, we came to a level grassy alp where our tents were awaiting us ready pitched. That was the most beautiful day we had in the mountains—the most beautiful, and for scenery the most varied. The following was our worst.

We had to descend into the depths of the Hispar Valley and mount along the side of its raging torrent. There was again no cloud in the sky, and the power of the sun was greater than ever. The precipices seemed to gather the heat and concentrate it upon us. The path, where there was any, was the very worst possible. Often there was no path, and we had to traverse dangerous cliffs overhanging the boiling torrent. The valley was utterly barren, there was seldom a rock to cast a moment's shade. Sometimes we had to stumble over dreary slopes of fallen stones, sometimes to plod through soft beds of sand, sometimes to scramble across rotten *parrís*. The only water to drink was the black filth that the river was hurrying along, and that was seldom accessible. When we could get at it we drank it by handfuls, and filled ourselves up with mud. We had no food with us, and could get none till we reached the village of Hispar. An hour's march below the village we were stopped by the series of mud avalanches previously referred to. They delayed us for nearly three hours. At last the hateful sun went behind the hill, flies ceased from troubling, and with the peaceful evening came our well-earned repose. Two days later (July 11th) we started to cross the Hispar Pass. Bruce and Eckenstein were already over the Nushik La. Roudesh in his turn, conveying all our spare baggage, followed the same (or, rather, a similar) route. McCormick, Zurbiggen, and I reached the summit of the Hispar Pass on July 18th, and Askole on the 26th, our slow progress being caused by the exigencies of the survey in weather that was oftener bad than fair.

We left Askole on July 31st and returned to it again on Sept. 5th, the intervening time having been spent over our expedition up the Baltoro Glacier and the ascent of Crystal and Pioneer Peaks. On Sept. 7th we crossed the Braldu River at Askole, and began the ascent of the opposite hillside. On looking across the river to the path from the foot of the Biafo Glacier we saw an immense column of dust rising into the air. A great thundering arose from within it, and we soon per-

ceived that it was caused by the fall of a mass of rock, which was bringing down with it a dry avalanche of chips. The great rock came to a halt close to the path, in the neighbourhood of a number of other rocks, which had attracted our attention as we passed. They averaged about the size of a cottage, and the newcomer was as big as most of its predecessors. We camped for the night at a bleak alp, and crossed the Skoro Pass next day in abominable weather. I thought it evident that the pass must be over 17,000 feet high, and the estimate was confirmed when we set up the barometer (15·91 in. Air T. 36°). From my observation the altitude comes out 17,400 feet: 17,000 feet is the mean of Col. Godwin-Austen's boiling-point and my barometric determinations. From the amount and condition of the snow we passed over I think that this is below the truth. The north side of the pass affords a steep but easy scramble. We lunched at the foot of the cliffs, and the remainder of the way led us down a series of gorges, where we had constantly to be wading across the stream from one side to the other. At sunset we emerged into the fertile Shigar Valley, and encamped within the boundaries of the village of Askoro. The next day we strolled to Shigar along pleasant paths, with fields recently harvested all around, village succeeding village at brief intervals, all embowered in well-grown trees.

To our eyes, accustomed as they had been for months to the wildness of barren rocks and the chastity of snow, the smiling landscape into which we had so suddenly emerged seemed beyond measure luxuriant. The air, too, was full of colour, and bathed all nature in its tender glow. Busy peasants, driving oxen to tread out the corn, and singing as they drove, made the fields animated and musical. Birds twittered among the trees, butterflies flitted about in countless numbers, and we walked along as in a dream. The picturesque architecture of the group of mosques in the principal village of Shigar showed that we had returned to regions where men have leisure for art. Next morning (September 19th) we embarked on a skin raft, which carried us down the Shigar River to the Indus. We landed, and in half-an-hour reached the scattered villages of Skardo, capital of Baltistan. Of our journey from Skardo to Leh to verify our instruments, and from Leh back to Srinagar, it is unnecessary to speak. We reached Abbottabad on October 28th, exactly seven months from the day on which we left it.

I have been warned that, in addressing the Royal Geographical Society, I should avoid descriptions of mountaineering and too much reference even to mountain exploration. I have endeavoured, as far as possible, to follow this advice. Before concluding, however, I make bold to transgress into the region of prophecy, and to affirm that it is the destiny of this Society to hear much more of mountains in the future than it has heard in the past. The great bulk of the habitable parts of the world and even of the traversable deserts have

now been explored. There are few flat areas of any great extent that remain to attract the adventurous. The abodes of snow, polar and mountainous, alone stand forth to challenge exploration. It is not in the nature of man to decline that challenge. Nor is it likely that you will refuse to listen to the reports of the travellers who accept it. Your destiny is, I think, assured. The world's great mountain ranges are the workshops where continents are formed and renewed. There nature's forces are beheld in grandest activity. Few indeed of these workshops have been investigated by man with any approach to completeness. Most mountain ranges are not even mapped. The Alps, indeed, are now well known. Mr. Freshfield and his successors have done much towards the investigation of the Caucasus. In the Andes of Ecuador Mr. Whymper showed how to organise and carry out with completeness of success a journey of exploration in a distant and (Humboldt and others notwithstanding) practically uninvestigated mountain range. My desire and attempt was to follow Mr. Whymper's example and to work on the lines he had laid down. Future travellers will be able to do much more in the same length of time than was accomplished by our party.

The question of equipment is all-important for mountain travel, where everything carried must be the lightest possible. Our equipment was good as far as it went, but it can be much improved; and with improved equipment greater efficiency can be and will be attained. In due season the ranges of Central Asia will receive the attention they demand. They will be mapped—which at present none of them are from a mountain student's point of view, just as an ocean is not mapped when you have fixed its shores, but only when you have sounded its depths. Their glaciers will be explored, their peaks will be climbed—peaks far loftier than any whose summits we were able to reach; and when this has been done, and a knowledge of the nature of the foldings and wrinklings of the Earth's crust has been attained, it will be found that the work was, from a scientific and geographical standpoint, just as well worth doing as the work of exploring any region of the world suited to be the home of man.

Before the reading of the paper, the President, the Right Hon. Sir M. E. GRANT DUFF, made the following remarks: Many of you have become well acquainted with the recent journeys of Mr. Conway through the very interesting papers which have appeared in our *Proceedings* and in our *Journal*, but before Mr. Conway went to India, he had made a very considerable reputation amongst mountaineers by his travels in the Alps, and by the works he has written upon them. He has also travelled in many other parts of the world, especially in Egypt, studying the artistic side of archaeology, and was for some time Professor of Art in the Liverpool branch of the Victoria University. You will perceive accordingly that Mr. Conway is a person who has had a very varied training and is acquainted with many different subjects, and you will expect, what I am perfectly sure you will obtain, a very interesting paper from him.

After the reading of the paper the following discussion ensued:—

Colonel GODWIN-AUSTEN: I have listened with extreme interest to the lecture. Mr. Conway has brought vividly to my mind scenes of many years ago. I must first thank him for so kindly alluding to my services at that time. I think, however, he has rather given me credit for more than I did. I was not really the discoverer of these glaciers. Previous to my visiting that part of the Himalayas, the great glacier at Arundu had been seen by Mr. Vigne, at the time before we had taken the Punjab (1835). Then Dr. Falconer (1841), and Dr. Thompson also (1847-48), saw the ends of two of the glaciers, and they were followed again in 1856 by one of the Schlagentweits—Adolf, I think—who was afterwards murdered in Yarkand. When I went there in 1860 my first season's work was to survey up to the Masherbrum Ridge and the glaciers descending towards the Shyokh River. In 1861 from Askole I crossed the end of the Biafo Glacier, and went on to the Mustagh Pass and surveyed the Punmar Glacier, which came down from that direction, and I then had on my plane-table a large gap between the Masherbrum Ridge and the Punmar Glacier, of which I knew nothing. I did not at that time know that a glacier so large existed there, and my surprise was therefore extreme when proceeding up the Biafo Valley I came suddenly on the great breadth of ice, which stretched in front of me, marking the end of the Baltoro Glacier. I then saw the valley was much longer than I imagined, and continued on that glacier for about five days; but did not get anywhere near the point Mr. Conway was able to reach. I only reached on that occasion the long glacier which came down from Masherbrum on the south, but from other points I had fixed by plane-table surveying I was able to get a rough sketch of the upper portion. It is most satisfactory to me and everyone in this room to think that these glaciers have now been visited by such a good mountaineer as Mr. Conway; he went to this part of the Himalayas with the great advantage of knowing and having ascended a great many peaks in the Alps, and I hope we shall hereafter hear from Mr. Conway a fuller account of what he has seen, his impressions of this portion of the Himalayas, and the differences between it and the Alps of Europe. The vastness of the country there, and its desolate appearance, cannot be described in words, and we have been most fortunate this evening in seeing the photographs which he was able to take, because it has given you some sort of idea of the country. It is the most striking country that anyone can possibly visit, but I cannot say it is all pleasure to travel through it, because the extremes of heat and cold are very great, and Mr. Conway describes very well the dreadful march up the Hispar Valley towards the great glacier. He was very fortunate in seeing one of the great rushes of mud and rock, which he described, for this reason, that although they occur almost daily, yet although you may arrive on the brink of any one of these nullahs where they occur, and see that one has gone by, it is not often one is there at the time to actually observe the phenomenon. I had the good fortune myself to see one which passed my camp under the Skoro La; had I not seen the way in which the enormous blocks were transported and thrown up on to the sides of the ravine I should have attributed it to glacial action in the winter months. Mr. Conway is of opinion that the accumulations of detritus in the valley of the Indus River have been brought about by this action. I think it has been a means to an end, but I do not think it has been the sole cause in that part of the world. You find every sort of action has gone on, as witness the lakes which have been formed along the course of the Indus very far back in time. The accumulation round Skardo is very interesting, because you have beds with enormous blocks which may have been brought down by these "Swa," as the natives call them, with great thicknesses of extremely fine silt formed in still water. The extreme cold of the period is indicated

in these finer silts by pieces of a similar silt being imbedded in it, which have retained their form and must have been in a frozen state when carried along by the stream and deposited. The whole region has passed through a long period of glacial action. I was also interested in what Mr. Conway said about the movement of these glaciers since the time when I was there, and I rather think in reference to the Baltoro and the remarkable rock which I noticed in my journal at the time, that the glacier has advanced, it is somewhat nearer to the terminal cliff than when I saw it. The glacier at Arundu, which is on the south of the Nusbik La, was advancing rapidly when I was there, and the rocks from the ice were rolling into the fields of ripe corn, which was being torn up by the ice. I will not detain you by further remarks; the ground traversed by Mr. Conway is so extensive that it is difficult to seize upon, and treat all points that might be of interest. On one point, the nomenclature of the ranges of the Mustagh and Karakoram, both names are those of passes as known by the natives, and I should call that portion of the range to the west of K2 the Mustagh, as far as the Hunza Nagyr Valley, while the portion to the eastward I should call the Karakoram up to the Chang Chenmo plain. The Hindu Kush could be retained for that portion north of Gilgit, and further to the westward. I thank Mr. Conway for giving us so interesting an account; both he and his companions deserve the highest praise for what they have done.

Sir MICHAEL BIDDULPH: I am sorry I have nothing ready prepared to tell you, and I cannot emulate my friend Mr. Conway in his description. I can only say a few words about those parts which I have visited and which are accessible to anyone. From my earliest youth I felt the greatest passion for mountain scenery, and fortunately, in every part of my life, I had the opportunity of visiting hills which have gradually grown greater and greater until I got to the Himalayas. In 1865, after four years' heat in the plains, which was shared by my wife and family, I found myself on the confines of Kashmir; and, having a little spare time from my duties, I thought I should like to see something really big in the way of mountains, and consulted my friend Major Strutt, and asked him what in the neighbourhood of Kashmir was really worth seeing. He pointed out a circle on the map with the figures 26,629. I said I think that will do. So having comfortably placed my family in Kashmir, I took leave and got on the trail. I had had the good fortune to read Vigne's Travels. He had described in most vivid terms his impressions of Nunga Parbat as he saw it from the first elevation north of the valley of Kashmir. When I crossed the same ridge it was hazy to the north-westward, and I saw nothing but a blank beyond the range which bounded the valley of the Kanchanjanga. So I contented myself with the flowers growing breast-high on the slopes around, and then I passed into the deep valley at my feet. Having stayed two days by the Kanchanjanga I ascended the western slopes and slept at an elevation of 16,000 feet, on the top of a pass, with a keen north wind blowing. On the following morning I thought I would console myself by trying to shoot ibex, and the Shikaris soon put me on their tracks; but while looking north-westward for what I was really in quest of, I suddenly thought I saw a glimpse of something glittering through a cloud. It is impossible to describe to you what the sensation was of seeing that glitter in the cloud far above any land. By-and-by the shining increased, and what proved to be a snowy mountain came out of the heavens; and this magnificent mountain was laid bare against the blue sky. After feasting my eyes upon this surpassing spectacle I thought no more of following ibex, but proceeded to sketch Nunga Parbat, and secured one of the views, now exhibited in the tea-room. I afterwards passed some delightful days exploring the base of the mountain. I must now describe to you what may be seen from the

plains. You will understand that plains extend from the Indian Ocean, at Karachi, right round to the Bay of Bengal, always bounded by the vast ranges of the Himalaya and its offshoots. The mountains are only visible in certain states of the atmosphere; one may be close under the hills without even a glimpse of them; and again one may be 150 miles distant and yet see them floating in the haze of the horizon.

It was my good fortune to be travelling with Lord Napier, of Magdala, on a tour of inspection to Darjiling in the month of December. I had had frequent opportunity of enjoying views of many portions of the main range, but as yet had not seen Kanchanjanga, reputed to be the second highest of the whole chain, and said to be a magnificent spectacle as seen from Darjiling. Journeying over those vast plains, diversified by groups of trees and watered by winding rivers, we at first looked in vain over fold after fold of park-like scenery to a horizon melted into the sky. It was early morning and we were 100 miles from the outer hills. By-and-by we see the loom of the range, a huge formless mass fading into space. Again a little further on our way, and there seems to be a shining in the warm mists which join plain to sky, but far above the loom of the hills. Again further on our way and the undefined assumes form, and we saw the head of Kanchanjanga floating in the sky. No words can describe the fascinating beauty of a mountain thus coming into view, where before nothing was visible. The circumstances of the transformation, the aerial character of the horizon, the situation and want of form of the low hills, all combine to give a supernatural appearance, which must be seen to be appreciated.

Having done my best to convey to you impressions of these scenes, let me hope that some of you may be able to tear yourselves away from this busy town and go to India, and for yourselves judge what the Himalaya Range is like. We all are, I am sure, exceedingly obliged to Mr. Conway for the admirable account he has given of his most interesting and arduous journey, and only hope he may have further adventures to tell us of at some future day.

MR. DOUGLAS FRESHFIELD: I will say only two words. I am sure you will be much better occupied in going to see the beautiful exhibition of sketches and photographs which Mr. McCormick and Mr. Conway have to show in the next room. I will only say that in the mass of topographical details which only imperfectly represent one side of a story that I hope will take two volumes to tell—which I hope also we shall not have to wait nine years for, as in the case of Mr. Whymper's book—we have perhaps lost sight of two main facts. First, Mr. Conway has been the first person to cross the greatest glacier pass that exists in the temperate regions of the world. Next, Mr. Conway has, with only one exception (Mr. Graham), and that not absolutely certain, reached the greatest height of anyone on this globe. He has certainly beaten the Schlegelutweits and Johnson. Moreover, Mr. Conway has measured his height, taken photographs and observations of several kinds at the top. To that I attach most importance of all. Somebody—a member of the Council—said to me the other day: "But I thought Conway was going up K2?" Mr. Conway was sent to that region not to attempt any desperate feat, but to give such a picture of the mountains as a man familiar with the European Alps could give—cross the great pass, attempt the easiest peak, and get as near the top as he could—and I think he did his work most admirably, and I am quite sure the Geographical Society have sent out few travellers who have brought back more fruitful results. I say fruitful because I think that his travels, when fully published, will interest Anglo-Indians in mountaineering, and that Mr. Bruce's Ghorckhas will solve the mountaineering problem. If you can teach these soldiers to act as good mountain guides, then you have solved the problem of the exploration of the snowy

Himalayas. These Ghurkhas, I am glad to say, are going to receive from the Alpine Club special rewards, which will mark them in the estimation of their comrades and in their own, and will encourage others to undertake, with the assent of their officers, similar work.

The PRESIDENT: We have had a great many pleasant evenings and excellent papers this year—better than any year since I have occupied this Chair—but none better than the one we have listened to this evening. You will instruct me, I am certain, to give your very warmest thanks to Mr. Conway, and unite with Mr. Conway all those gentlemen who have addressed us.

LIEUTENANT PEARY'S ARCTIC WORK.*

By CYRUS C. ADAMS.

CIVIL ENGINEER R. E. PEARY, lieutenant in the United States Navy, was compelled to return to his field of Arctic work, in July last, without publishing a detailed record of his labours in the region of Inglefield Gulf, North-west Greenland, and of his journey on the inland ice to Independence Bay on the north-east coast ($81^{\circ} 37' 5''$ N. lat.), all of which occupied him from July 27th, 1891, to August 6th, 1892. The reason can be briefly told.

He arrived home in September 1892. He had only nine months in which to raise funds and make preparations for his next expedition. He desired, if possible, to earn, by his own efforts, the money he needed. The lecture platform seemed to offer the best opportunity. For six months he addressed audiences nearly every week-day and often twice a day. He augmented his receipts by well-paid articles for the periodical press and in other ways. In nine months he accumulated about £6000, and he had asked no man for a shilling.

Meanwhile he had devoted all the time he could spare to the preparation of his book. The manuscript was about four-fifths completed when, on July 2nd last, his vessel, the steam sealer *Falcon*, started north from New York with the second expedition. He had some thought of leaving the completion and publication of the book in competent hands, but he finally decided to defer the work until his return. He was also unable to visit England and address the Royal Geographical Society in compliance with their invitation, an opportunity he had hoped to improve, until two months before his departure.

Soon after he returned home he addressed the Academy of Natural Sciences, Philadelphia, on the geographical and scientific results of his work. This address has not been published. He prepared a fuller

* Map, p. 384.

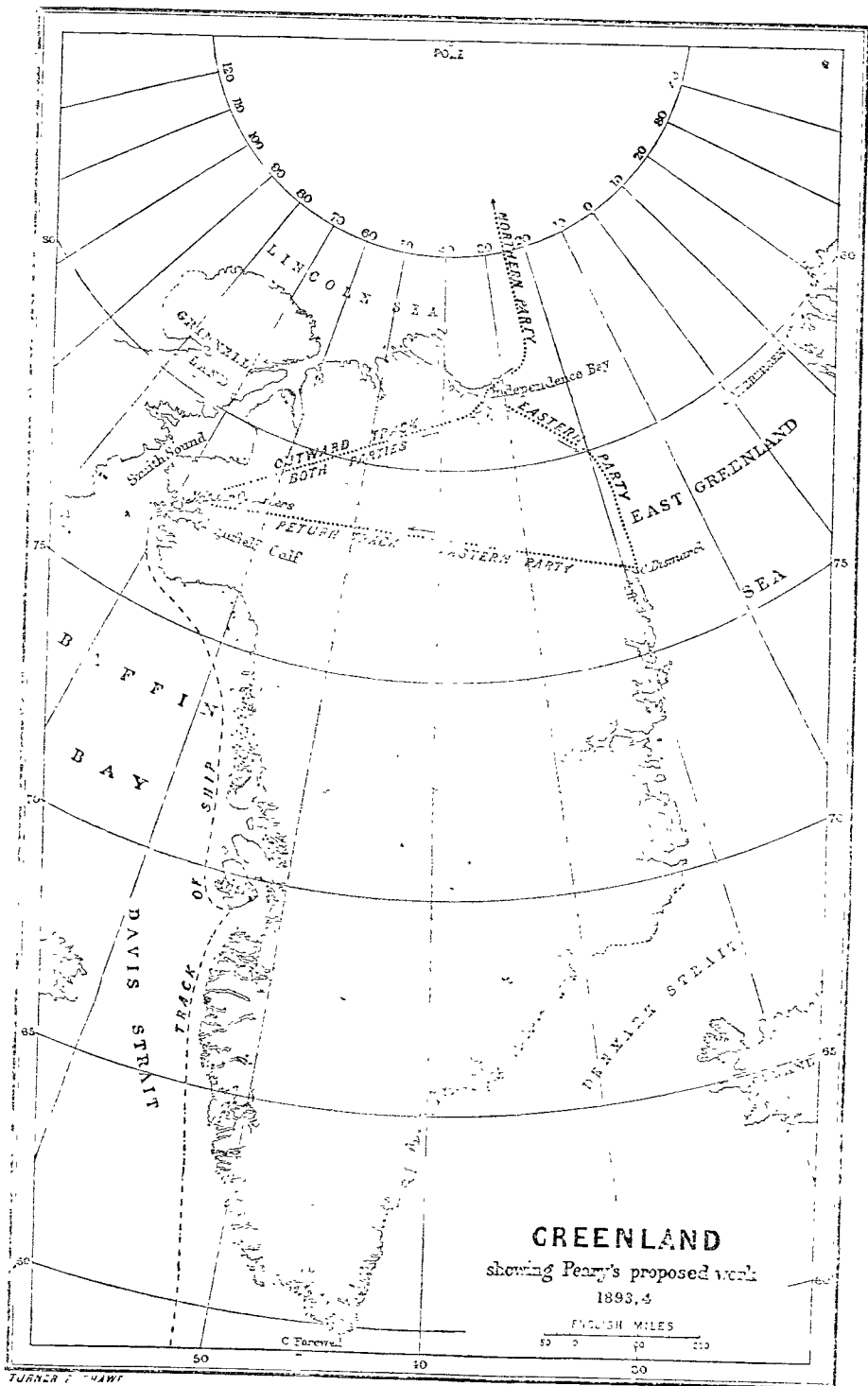
though much condensed statement of these results for the American Geographical Society, which has been printed (*Bulletin of the American Geographical Society*, vol. xxiv. No. 4, pp. 536-558, 1892). The writer was permitted to read the entire series of notebooks kept by Mr. Peary during his year of Arctic service, and, with the consent of the explorer, he has prepared this statement of some phases of the work. Much of the detail here given has not been published in any form.

The main purposes of the expedition were, if possible, (1) to outline the unknown Northern Coast, and to reach it by using the inland ice as a highway; and (2) to study the Smith Sound Eskimos. The base of operations was McCormick Bay, the first indentation of the coast north of Murchison Sound. The position of the camp, Redcliffe House, was $77^{\circ} 43'$ N. lat. The party of seven persons included Mrs. Peary.

In the house which was erected on a slight eminence about 100 feet from the waters of McCormick Bay, Mr. Peary seems to have solved the problem of a comfortable Arctic abode. He has fully described it in the article above referred to (*Bulletin Amer. Geog. Soc.*, pp. 547-548). In brief, the house was a light 12×20 feet structure (inside measurement), with double walls, inclosing a 10-inch air space. There was a triangular air space between the ceiling of the two rooms and the roof sheathing, and the rooms had three layers of tarred paper between them and the exterior air. The interior walls were hung with blankets. The house was surrounded by a wall of provision boxes and stones, banked up with snow, leaving a narrow passage around the structure. The ventilation secured by an air-shaft through the roof was excellent. No frost found lodgment on the interior walls, and by sinking the fire-bed of the stove below the level of the floor the temperature of the lower part of the two rooms did not fall below the point of comfort, and there was no complaint of cold feet. The average temperature for twenty-four hours, measured on a cold winter day by six thermometers, from the floor to 6 feet above, was over 58° Fahr. During some of the coldest winter weather only seven pounds of coal were consumed in twenty-four hours.

Most of the time, until darkness set in, about November 15th, was devoted to hunting. The natives gave much assistance. The Nimrods of the party were not successful in securing seal for dog-meat, but the Eskimo hunters procured an ample supply. The Eskimos pay little attention to hunting the reindeer with their rude weapons. The animal is comparatively abundant, but plays a very small part in the domestic economy of the Arctic Highlanders. The white hunters, however, derived from the natives some very useful hints for stalking the reindeer. They secured nearly fifty animals, which gave an ample supply of fresh meat and skins for clothing.

In addition to the ethnological, meteorological, and other studies



of the winter season, the entire period was devoted to minute experimentation, covering every phase of the equipment and preparation for the spring sledge campaign. The result of Mr. Peary's study of Eskimo clothing was that he discarded all wearing apparel he had taken from home except a suit of underclothing and light woollen socks. His complete winter outfit consisted of a kooletah, a coat of reindeer skin with attached hood, draw-strings about the face, waist, and wrists, and sleeves large enough to allow the arms to be withdrawn and folded across the breast; a timiak, a garment made like the kooletah but of seal-skin; nannookes, or short trousers made of bear-skin reaching from the waist to just below the knees; and kamiks, or native boots of tanned seal-skin with soles of oogsook seal and legs reaching to just below the knee. In his opinion Polar travellers should avail themselves of deer-skin clothing as the only thing that will exclude the searching Arctic wind. The entire outfit weighed about 13 lbs. The spring deer-skins were much lighter and thinner as to leather than those secured in autumn; but the fur was as heavy and in as good condition as in autumn.

As Mr. Peary expected on the inland-ice trip to sleep on the snow surface or in snow dugouts, all the men had ample experience, on some of the coldest nights, sleeping in their reindeer bags in a snow igloo, or hut, which was built for this purpose. In a temperature of -35° Fahr. Mr. Peary, wearing only a Jaros undershirt and a pair of short reindeer-skin stockings, was perfectly comfortable inside his bag. His experiments led him to discard the sleeping bags made of reindeer skins of Norway and Sweden which he had taken with him, and which weighed 20 lbs. each, and he substituted bags weighing only half as much, and cut after his own pattern, which proved in every way more comfortable. He thinks single sleeping bags are decidedly superior to bags holding several men like those of Dr. Nansen. When several men occupy a bag the movements of one disturb all the others. He found that his one-man bags of the winter skins of the Arctic reindeer were quite comfortable in temperatures of -35° and -40° , even when the occupant wore no clothing whatever in the bag.

Mr. Peary went north believing that the toboggan style of sledge was best adapted for inland-ice work. His experiments convinced him that this was a mistake. The party made ten sledges of seven different styles, and the three that were taken north were those which best stood the test. The three sledges were designed after the McClintock pattern, but were very much lighter, weighing respectively 48 lbs., 35 lbs., and 13 lbs., and adapted for loads of 1000 lbs., 600 lbs., and 400 lbs. Peary took to Greenland both ash and spruce timber for sledge-making. He soon found that spruce was not strong enough for a team of powerful dogs, and the sledges he took north were of ash throughout. He used reindeer horn for knees or braces at the intersections of the crossbars

and uprights, and the bed on which the load rested was of seal-skin lashings.

Two weeks were spent after May 1st in carrying the supplies up the mountain slope at the head of McCormick Bay, and far enough up the slope of the inland ice to make good progress possible. The journey proper began on May 15th, and ended at McCormick Bay on August 6th. As a feat of sledge travelling it ranks among the notable journeys. Peary started north with four sledges, three companions, and dog-teams. The supporting sledge with two men turned back after reaching the basin of the Humboldt Glacier. Peary, with Astrup, three sledges, and the dog-teams, made the round trip of about 1300 miles, including 52 miles of land travel at the north-east coast. From the start on May 15th until he reached the northern edge of the ice-cap, where he left his sledge to travel 26 miles overland to Independence Bay, Peary was forty-eight days on the way. During this time he was snow-bound four days, fog-bound one day, and a broken sledge and high temperature, softening the snow beyond the marching-point, cost him three days more. The actual marching-time was forty days. The distance travelled was about 650 miles, which gives an average of $16\frac{1}{2}$ miles for every day of sledging.

The return sledge journey occupied thirty-one days, during three of which the explorer was detained in camp by the severest storm he encountered. He was also embarrassed for two weeks while travelling along and crossing the divide between the eastern and western slopes of the ice-cap by almost perpetual fog. The sledging work of the homeward journey was performed in twenty-eight days. The distance was about 600 miles, a daily average of about 21 miles. For several days after emerging from the clouds Peary, with two sledges (one having been abandoned), made from 30 to 40 miles a day. The round trip was made without any previous establishment of supply depots, and every ounce of food, except two musk oxen and a calf secured on the north-east coast, was carried on the sledges.

Mr. Peary started with twenty dogs, reached Independence Bay with fourteen, and returned to camp with five. The others, excepting two with which the supporting party returned home, succumbed or were killed from time to time for dog food. They were all North Greenland animals, and Mr. Peary believes that no dogs can surpass them for sledge hauling. They may be made to work very hard, and for long journeys, and will keep in good condition on a daily ration of a pound of first-class pemmican apiece. It is his experience that an Eskimo dog will haul just about half the weight that is regarded as a good load for a man, and that he will take it about twice as far as the man would in a day. Two hundred pounds is considered the maximum load for a man, though 238 lbs. were hauled per man during the Nares expedition. Dr. Nansen, with a load of about 200 lbs. per man, averaged

7 miles a day across the inland ice. The adult male dogs of Whale Sound will pull a load of 100 lbs. each under almost any conditions, except where the snow is so soft that they sink into it deeply; and they will drag this load from 10 to 20 miles a day, and much heavier loads a far greater distance a day under exceptionally good conditions of travel.

Mr. Peary had the best of success in dog-sledging on the inland ice. In 1250 miles the dogs, assisted to a very small extent by sails, supplied the entire motive force fully five-sixths of the time. The men got into harness themselves invariably after a fresh fall of snow, and during the climb up the slope of the ice-cap both from McCormick Bay and from Independence Bay.

Peary used both ski, or Norwegian snow-skates, and Indian snow-shoes, but Astrup confined himself entirely to ski. These accessories were all-essential. The ski far surpass the snow-shoes in speed and ease of locomotion; but there are times when the snow-shoes are preferable, particularly after a fresh fall of snow before the meridian sun has shone upon it a few times, or it has been packed by the wind. At such times the ski drag as if over sand.

Peary usually trudged on in advance, laying the course and breaking a path for the dogs, following in single file, and encouraged now and then by Astrup's whip. It was fairly heavy going nearly all the way, though on the return journey, near the end, and at an elevation of 5000 to 4000 feet, a hard and not very rough snow-crust was struck, over which as rapid progress could be made as over most bay ice. The lowest temperature throughout the journey was -5° Fahr. on July 18th. The sleeping-bags were not used after the third week in May except to lie on, and one of them was thrown away. Usually the men simply lay down upon the snow in their fur clothing, after tightening all the draw-strings to keep out the wind and snow, and slept in perfect comfort. While using their sleeping-bags, they wore in them only their undershirts or nothing at all. Alcohol was the fuel used, and that simply for cooking purposes. They carried no tent and built no shelter, except in very stormy weather, at the camps, when a low wall of snow-blocks was thrown up around three sides of a narrow rectangle, the open side away from the wind, and a cotton sail forming the roof.

The wind blew strongly and incessantly, and its almost invariable direction was down the slopes of the ice-cap. When they were west of the great divide, or backbone of the inner ice mass, the wind swept down the gentle slope from the east, and *vice versa* when they were east of the divide. The wind was more variable in direction, and not so strong at the summit of the divide, though strong enough rapidly to drift the fog that constantly enveloped them.

Mr. Peary desired, on his northern route, to travel near enough to the western edge of the ice-cap so that if possible he could look down

on the continuation of the Smith Sound outlet to the north and map the north-west coast of Greenland. He failed in this purpose, and the reasons are interesting.

He found that behind Petermann, Sherard Osborne, and other fiords, are glacial basins widening, fan-shaped, from the heads of the fiords, extending inland 30 to 50 miles east of the fiord heads, and considerably depressed below the general level of the ice-slope. These basins are separated one from another by very prominent divides, whose summits are from about 5000 to over 6000 feet in height, while the basin plateaus are only 3500 to 4200 feet above sea-level. In his desire to skirt the edge of the ice-cap he attempted to cross these basins, and became involved in the phenomena that mark more rapid ice movement and the birth of glacial rivers. In other words, he met numberless crevasses, yawning for the destruction of his little party, and he was put to no end of trouble to circumvent them. Some of them were impassable, and in all cases he was eventually compelled to turn inland to get around the heads of the basins. Fortunately, at the place where he reached the northern edge of the ice-cap, he was considerably nearer the west coast than at most points along his route; and he has no doubt that, from his lofty elevation of over 5000 feet, he saw the entrance to Victoria Inlet where it joins Lincoln Sea.

The nunataks, or land-masses appearing above the inner ice, which are so characteristic of the region of the ice-edge in South-west Greenland, are almost wholly lacking along the north-western and northern peripheries of the ice-cap.

Sastrugi, or ridges of snow heaped up by wind action to a height of 2 to 5 feet, their main axis usually extending at right angles to the prevailing direction of the wind, were very common along the northern journey, but were not met on or near the summit of the ice-cap. Crevasses were not encountered except in the glacier basins. Mr. Peary knows of no obstacle on the inland ice away from the glacier basins of the coast regions that can defeat a well-equipped sledge party. He believes he can reach the north coast of Greenland on the inland ice every time he makes the attempt.

He proved that the northern extension of the great interior ice-cap ends below 82° N. lat. He followed its edge about 60 miles, and he saw it stretching away west and east for a considerable distance. A few glacier arms extend from it to the inlet north of the mainland, and the largest of them, Academy Glacier, which empties into Independence Bay, compares in size with the largest of the South Greenland glaciers.

The western slope of the inland ice from the divide, or main axis of the ice-cap, is extremely gentle and, to some extent, undulatory. The angle of slope from the divide to the northern edge is much greater, though the slope is still very gentle. In ascending from the northern edge to the summit plateau on his homeward journey he climbed on the

first day 1000 feet in 10 miles, on the second day 1300 feet in $21\frac{1}{2}$ miles, and on the third day nearly 1000 feet in 20 miles. When he descended from the divide, diagonally down the west slope, about 30 miles' march was required before he was certain that he was getting nearer the sea-level.

He was able to make out both shores of Victoria Inlet in the neighbourhood of its entrance into Lincoln Sea. He traced the higher mountains that border the northern side of the channel all along from Lincoln Sea to Independence Bay. He was unable, at his distance from the western edge of the ice, to see the southern border of the channel between 45° and 40° W. long.; but in his march along the edge of the ice-cap to the south-east he was able now and then to see the channel through rifts in the mountains that border it. He has no doubt that he has traced the northern border of the mainland and established the insularity of Greenland.

The northern edge of the ice-cap, at the point where Peary left his sledges to descend to the land, was about 4000 feet above *terra firma*. The landward slope stretched away for over 2 miles before its foot rested on the land, and the descent of this steep face of the ice-cap was very difficult. As far as the explorer was able to determine, the northern ice edge offers generally about these same characteristics as to height and slope. Many azure blue streams were tumbling down the ice face.

The route across the land to Independence Bay was strewn with big and little boulders. Much damage was done to the foot-gear, and some of the dogs' feet were cut. The country was much broken with hills and valleys, and the rock fragments and ground of igneous origin were reddish-brown in colour. Besides the large boulders, the surface was covered with small angular stones compressed and half cemented together by the enormous pressure of superincumbent ice-fields ages ago. There was a good growth of grass in some sheltered valleys on which the musk-oxen that were seen, twenty in number, were browsing.

On the edge of the north-east coast of Greenland, Peary climbed a giant trap cliff (Navy Cliff), whose north-east face drops almost vertically to the level of Independence Bay, 3800 feet below. Looking to the west he saw the eastern opening of the inlet that he had followed across North Greenland. To the north, north-west and north-east, stretched steep, red, brown bluff, on the other side of Independence Bay with a flat foreshore reaching to the water's edge. Two broad fiord or channel entrances were made out, one far to the north-west and one to the north-east of Observation Point. The unbroken bay ice stretched away to the white horizon of the Arctic Ocean. Peary could distinctly discern the broad expanse of the ice-covered sea, but the distance was too great to make out any details of the surface. The most distant land was far

to the north-east and must have been 60 miles away. It showed no ice-cap, and there were no signs of ice-cap on the lands west and north-west. Mr. Peary has no doubt that these lands are parts of an archipelago of unknown extent.

It was July 4th, 1892. The day was delightfully warm and calm. The position of Observation Point on Navy Cliff was fixed as $81^{\circ} 37' 5''$ N. lat., and $34^{\circ} 5'$ W. long.

Of the flora and fauna of this northern land, Mr. Peary has written:—

“I found flowers of numerous varieties blooming in abundance, conspicuous among them the ever-present Arctic poppy. Snow-buntings, two or three sand-pipers, a single gerfalcon and a pair of ravens were observed. Two bumble-bees, several butterflies and innumerable flies were also noted. As for musk-oxen, their traces are to be found on every mountain and in every valley; without making any search whatever for them we saw twenty, and all of these could have been obtained without the least difficulty” (*Bulletin of the Amer. Geog. Society*, vol. xxiv., No. 4, 1892).

During the ice journey, the only signs of animal life were a few puffins, birds of the auk family, that were seen nearly a hundred miles inland.

The distinctive feature of the homeward journey was the march along and across the summit plateau, about 8000 feet above the sea, during which Peary and Astrup travelled for nearly two weeks in a dense fog which hung to their garments like rain-drops. This top of the ice-cap is a comparatively level plateau. These were the most trying days on the inland ice. The men could scarcely see the length of their sledges, and most of the time it was possible to keep a course only by stopping every fifteen minutes to take the compass direction of the wind and following the indications thus obtained. Men, dogs and sledges were coated with minute opaque white frost crystals. Parhelia, fog-bows and sun-pillars on the fog were continually forming and vanishing, but all the gorgeous pageant could not recompense the travellers for the blanket shroud that enveloped them.

Another feature of the inland ice surface is the numerous snow hummocks, some of them 50 feet in height, formed where drift settles around some protruding bit of ice, and builds up snow hills. On July 31st and August 1st, when on the home stretch, about 5000 feet above the sea, the men travelled over the hard frozen surface without snow-shoes or ski, the only occasion when they dispensed, for any considerable distance, with these accessories.

By this journey the insularity of Greenland was established, the northern extension of the ice-cap was determined, the existence of detached ice-free land masses north of the mainland was ascertained, and the fact that the east and west coasts rapidly converge north of the

seventy-eighth parallel was proved. With regard to his geographical methods on the journey, Mr. Peary says:—

“My daily reckoning was kept by the compass, and an odometer wheel attached to the rear of the sledge. The circumference of this wheel being a trifle less than 6 feet 1 inch, one thousand revolutions of it made 1 nautical mile, and the revolutions were registered by the ordinary odometer mechanism.

“At four camps on the upward journey, and three on the return, not including the observations at Navy Cliff overlooking Independence Bay, this daily reckoning was checked by a complete series of solar sights, taken with a small travellers' theodolite, with a special vertical arc of large radius.

“The time was obtained from two pocket chronometers and a high grade watch, all of which were carefully rated before my departure and after my return, and were compared with each other almost daily during the journey.

“That these observations were not taken more frequently was due to the fact that, travelling as we did when the sun was north, and sleeping when it was south, the taking of a set of observations meant for me either no sleep at all, or, at best, but two or three hours of it. That even the field working of my sights was, however, not very far out of the way, may be inferred from the fact that, running on a compass course from my last observation camp, 150 miles north-east of McCormick Bay, and supposing myself to be 10 miles to the eastward of my outward course, I found myself, on reaching the head of McCormick Bay, but 5 miles to the eastward; in other words, I was 5 miles out in my reckoning.

“The freedom of the inland ice from all local attraction, and the consequent reliability of the compass, if its constantly changing declination be carefully watched, is of great assistance to the traveller.

“Elevations were determined by aneroids only, a special boiling-point apparatus, which I had ordered for the purpose of checking the aneroid readings, having proved on trial to be perfectly worthless” (*Bulletin of the Amer. Geog. Soc.*, vol. xxiv., No. 4, 1892).

The ethnological work of the expedition was the most noteworthy yet done among the Arctic Highlanders. Dr. F. A. Cook, who was in special charge, brought home the names of two hundred and forty-three natives living along the coast from Cape York to Peteravik, a little north of McCormick Bay, the most northern point where the natives of to-day are living. This is believed to be practically a complete census. Seventy-five natives spent more or less time at the winter camp, some of them coming from Cape York, nearly 200 miles away. All of them were photographed in the nude, and anthropological measurements were taken. In recent years the movement of population has tended towards Cape York, where the natives meet the whalers, and exchange their

walrus and narwhal ivory for wood, knives, needles, and other articles of great value to them. Mr. Peary does not believe they are decreasing in number at present. There were more births than deaths in 1891-92. Evidence was found that, at rare intervals of great scarcity of food, cannibalism has been practised to a small extent. While the natives are as nearly pure-blooded as any aboriginal tribe, one young man was found who showed unmistakable traces of white blood. He is believed to be a relic of the Polaris party at Lifeboat Cove. Peary found the natives helpful, gentle, and faithful, and he gives them a far better reputation than some earlier explorers have done. He had an Eskimo settlement around him all the winter. He insisted that every adult should work for him, and he paid them well in goods. All his skin garments were made by native seamstresses, and the men built snow entrances and huts, lashed the sledges, scraped skins, cared for the dogs, and did much other work.

There are seven guns in the tribe, some of which have been repaired with remarkable ingenuity. Their dialect differs considerably from that of the Eskimo of the American mainland, and still more from that of the South Greenland Eskimo, which would seem to indicate that they are derived from immigrants, who came north across the archipelago directly to the Smith Sound region. The average height of the male adults is $5\frac{1}{2}$ feet; of the female adults, 4 feet and 8 inches; average weight (nude) of the men, 135 pounds: women, 118 pounds. The natives took very kindly to civilised food, showing that their taste has been cultivated since they declined to eat the bread they found in Kane's stores. All the men in Peary's party excelled the most robust natives in contests of strength. They have a large fund of hunting stories, and celebrate the prowess of past and present Ninarods of the tribe both in narrative and song. They are very full-blooded, and when their faces are washed their cheeks have a rosy tinge. In the spring of 1892, there was a mild attack of influenza or *grippe* in the tribe, and the Danish records show that the same disease prevailed in South-west Greenland. The natives encounter but few dangers, and deaths by accident are not common. Deaths resulting from childbirth are quite common, though the average length of life compares favourably with our own longevity. The mortality among young children is small. The oldest person met was not over seventy years of age; among a hundred men and women ten or twelve were over sixty years of age. There is only one bachelor in the tribe; he is feeble-minded, and no woman will live with him. Mr. Peary's ethnological chapters have been prepared and are full of the most minute information.

In the latter part of April, 1892, Mr. Peary, accompanied by Mrs. Peary and a native driver, made the round of Inglefield Gulf, travelling 250 miles in a week. He made as careful a survey of the unknown shores of the Gulf as the circumstances permitted. He thinks that the

scenery around the head of the gulf, with its snow-capped mountains and glaciers, as large as any in South Greenland, is unsurpassed in Arctic regions. The few glaciers he was able to visit were remarkable for the fact that only one showed a terminal moraine. A few families of natives live about half-way up the gulf.

Mr. Peary says that the mapping of the whole Sound region and the adjacent coasts is inaccurate, and in some respects quite misleading. He was not able with his small force and limited time to make wholly satisfactory rectifications, and the survey and mapping of this region is a part of the programme of his present expedition.

The winter of 1891-92, on the whole was very mild in North-west Greenland. There was an unusual amount of open water in Smith Sound; Mr Peary thinks the snow-fall was exceptionally heavy, and this kept the ice comparatively thin. Natives from Cape York reported a moderate winter, and shore-ice not over 15 inches thick. In the third week of February a great Föhn storm occurred, which was marked by a very high warm wind and torrents of rain, that swept the shores of McCormick Bay clear of snow and nearly washed the little settlement away. The storm continued for two days. Lieutenant Ryder reported a Föhn storm in Scoresby Sound on the east coast in the same month. The highest and lowest temperatures observed by Peary occurred in February, and showed a range of 90° , from -50° to 40° Fahr.

I have not seen the results of the tidal observations, recorded by means of a tide gauge in McCormick Bay. This work was in charge of Mr. Verhoeff, who is believed to have perished in a crevasse a short time before the expedition sailed home. Mr. Peary says the tidal influence is not a very conspicuous phenomenon in the neighbourhood of McCormick Bay, though there was a tidal track in the ice along the shore, and a consequent overflow of water upon the ice.

Mr. Peary's collections illustrating ethnology were large and comprehensive. Most of them have gone to the Academy of Natural Sciences, Philadelphia, and there is also a fine display in the Ethnological Exhibits at the World's Fair in Chicago.

Mr. Peary's desire to complete the work he had carried so far in the Smith Sound region and on the North coast, led him to organise and equip the expedition which sailed from New York on July 2nd, and from Portland, Me., on July 8th. Practically everything he desired for his equipment was procured. The party numbers fourteen including Mrs. Peary and her maid. Mrs. Peary is a good shot, is fond of out-door sports, is not averse to roughing it, and is in the prime of health and vigour. The results of her participation in the first expedition were fortunate. She will, of course, remain with her maid at the house, which will be erected on the north shore of Murchison Sound or Inglesfield Gulf.

Mr. Peary expects to visit every Eskimo settlement from Cape York

to Peterawik, for the purpose of making the most thorough study possible of this isolated branch of the Eskimo family. He also intends to make a careful survey of the coast-line from Cape York to Smith Sound.

It is probable that his house will be erected in Bowdoin Bay, Murchison Sound, within a few rods of a tongue of the inland ice, up which he will ascend to the ice-cap.

It will take only two or three days to erect the house, and then three parties will be put in the field for the fall work. One party will take a large sledge-load of provisions upon the ice-cap, and as far north as possible, where it will be *cached* for the use of the spring sledging expedition. Another party will go out for reindeer to secure fresh meat and skins for clothing. The hunting will be chiefly along the shores of Inglefield Gulf, which were not touched by the hunters of the first expedition. The third party will make a careful survey of Inglefield Gulf to replace the reconnoissance survey of 1892. Mr. Peary desires to bring home much material for accurate mapping. A steam launch will be used in coast exploration.

Meteorological, tidal, and other observations will be carried on during the winter. Mr. Peary will participate in the simultaneous auroral observations that are to be made within the next year by many observers, on the system devised by Dr. M. A. Veeder of Lyons, New York State.

The spring sledging campaign will begin about the middle of March next, two months earlier than in 1892. Eight or nine men with dogs and sledges will start for Independence Bay. The route to North Greenland will be a mean between Peary's northward and return routes in 1892. Keeping at an elevation of about 5000 feet, the explorer expects to avoid both the crevasses in the glacier basins of the west, and the fog of the summit plateau.

Mr. Peary has taken with him eight burros or Mexican donkeys. These hardy little animals are accustomed to carrying heavy loads of silver ore through the snow of the Rocky Mountains in Colorado. Snowshoes will be fitted to their feet as has been done with horses in Alaska. It is hoped they may be successfully used in sledge-hauling on the inland ice. If the experiment fails they will furnish food for the dogs. Carrier-pigeons are also a small feature, and it is hoped to use them to send messages from the inland ice back to the camp.

Mr. Peary thinks he will reach Independence Bay not later than May 1st to May 5th. Here the party will divide into three sections. One of them with three men will sledge south-east along the coast, and complete the survey of that unknown shore to Cape Bismarck. It will then strike straight across the ice-cap for Inglefield Gulf, returning as soon as possible to the winter camp.

The work of the other five or six men will depend upon circumstances. Peary has two prime objects in view for his work north of the

Greenland mainland. He wishes, if possible, to make a complete survey of the land masses north of Victoria Inlet, whose southern edge he has seen. While this work is in progress he desires also to reach the highest attainable north. Two or three men will at once set about the exploration of this supposed archipelago. If the ice conditions on the frozen sea are at all favourable for sledging, two or three men with a sledge will start towards the Pole and travel as far as they can, the intention being, in any event, to return to Inglefield Gulf the same season. The explorer believes that if he is at all fortunate he can complete the work there is for him to do on the north coast of Greenland in a single season.

Whether the expedition will come home next autumn it is impossible to say. It depends upon whether Mr. Peary decides that still unattained results will make it profitable to remain another year. At all events a vessel will visit the camp next summer.

By means of a phonograph Mr. Peary expects to bring back specimens of the spoken language of the natives. His house will be lit by electricity and heated by kerosene oil. Among the members of his party are Eivind Astrup, the young Norwegian whose courage and fitness were tested on the long sledge journey of 1892, Dr. Edward Vincent, surgeon and ethnologist, E. B. Baldwin, meteorologist, and F. W. Stokes, artist. Three members of the party, besides the leader, are qualified for surveying and map work.

Robert E. Peary, C.E., U.S.N., is about forty years old. He is a native of Maine, where he was educated at Bowdoin College. A fine specimen of physical manhood, he has long been a student of Arctic research, and had been planning for years to engage in the work. He is a civil engineer by profession, and for several years has been a member of the Engineer Corps of the United States Navy.

THE INFLUENCE OF GEOGRAPHICAL POSITION ON THE DEVELOPMENT OF THE AUSTRALIAN NATIVES.

By ERNEST FAVENC.

It has been customary hitherto to regard the Australian aborigines scattered throughout the continent as forming one common family of equally low type and doubtful descent. This hasty conclusion leaves out of sight the influence of locality which has been at work amongst them, an influence so strong, that centuries of improvement separate the native inhabitants of some portions of Australia from those of other portions. As a rule, ethnologists who have made a study of the natives have largely confined their observations to the blacks of certain districts, whereas, in order to arrive at any just conclusion as to the highest

standard reached by the natives before the arrival of the whites, the aborigines of the whole continent must be contrasted. What possibilities may have been in store for the Australian, had his self-education not been sharply arrested by the invasion of the Europeans, it is hard to say, but the evidence tends to show that many tribes would have attained a fair social grade, whilst others would have remained stationary. When the size of Australia is taken into consideration, these contrasts may appear but small and paltry, but their significance is as great as in those found in countries where a high state of civilisation has existed for years. In judging the relative positions of different tribes, the attention must be solely concentrated on their primal condition as savages knowing nothing of intercourse with the whites. It is scarcely necessary to repeat here what is, unfortunately, too well known, that when once the blight of our contact falls on the native, he exchanges his few virtues for whatever vices of the European are within his reach. From a hardy hunter, cunning in the use and construction of his weapons, he sinks into an indolent loafer, intemperate when possible, and lost to all the rude arts of his forefathers. Unhappily this doom has overtaken those who were most advanced, and formerly inhabited the eastern portion of Australia. They are now nearly all either dwindled down to a mere handful or hopelessly degenerated.

The results by which we can best gauge the status of the aborigines are by the finish of their implements of war and the chase, the elaboration of their peaceful ceremonies and rites, and their attempts at ornamentation and decoration. With regard to their habitations, their nomadic habits prevent any reliable comparison being drawn, as some of the superior tribes scarcely construct any shelter save during the rainy season, whilst others, far inferior in all other respects, build the nearest approach to permanent villages found in Australia. Those portions of the continent where game was plentiful, the rivers permanently watered, and the surface of the country, boldly diversified, produced the highest examples of savage culture. These districts may be said to be monopolised by the greater portion of the north coast, the whole of the eastern, and about one-third of the southern. Included are: the northern half of the northern territory of South Australia, nearly the whole of Queensland, New South Wales, and Victoria.

Here we find that in their original savage state the aborigines possessed weapons elaborately finished and carefully preserved. Their hunting spears were barbed with great pains and nicety, their clubs and throwing-sticks serviceable and well-balanced, and their shields carved and coloured in a grotesque but still rudely artistic manner. The baskets woven by the women were often worked in symmetrical patterns by means of different coloured grasses. The skins of opossums, native bears and other small animals were cured and neatly sewn into rugs. They made strong string out of the bark of the currayong tree, and

with it turned out fishing and kangaroo nets, the last-named being of considerable height, length, and strength; it was stretched on stakes in a segment, and the game driven into it on a well-ordered plan. They had mysteries and rites for the initiation of the youths into manhood, and, although throughout the length and breadth of Australia nothing has ever really been found to justify the supposition that the blacks possessed any form of religion, save a hazy notion of an evil spirit, the natives of the east coast had certain crude myths and superstitions which, in the course of time may have assumed a definite shape.

The corrobborrees of these aborigines were not simply an uncouth dance, but exhibitions of skill requiring much practice. Their canoes, especially those found on the coast of North Queensland, were seaworthy enough for them to visit the islands of the different groups off the coast. At the Sir Edward Pellew group, in the Gulf of Carpentaria, the natives build canoes of small sheets of bark, firmly sewn together and the seams caulked and closed up with wax in a most workmanlike manner. They used flint-headed spears, so contrived that the head remained in the wound; the thrower, on recovering the shaft, could replace the head from a supply carried in a skin pouch. These spear-heads and flint-knives were obtained in particular quarries, being chipped in such a manner as to give a keen-jagged edge, with a skill and dexterity truly marvellous. In fact, to see some of the weapons formerly used by the blacks in their wild state, and reflect that they were made with tools of blunt stone and fire, is a revelation of patient industry.

These natives, inhabiting the eastern portion of Australia, had the advantage of being able to obtain food in comparative plenty and variety. They lived on the flesh of animals, birds, fish and reptiles, with edible roots, wild fruits and honey. The seasons were fairly regular, and they hunted on a recognised system, returning to their hunting-grounds and burning them off at stated times in the year. Their tribal wars were hotly contested, thus assuring a certain amount of emulation amongst the young men. Their pigments for painting their bodies were of many colours, and were kept rolled up in a skin case; the bands worn round the forehead were woven of hair and dyed of different hues.

There can be no doubt that their progress in what may be termed the liberal arts, so much in advance of their fellows, was due to the greater leisure afforded them by the nature of the country they inhabited, and its superior game-producing qualities. Between the sea, the coast range and the level country intervening, as well the edge of the great tableland, they had a healthy variety of surroundings. Had they ever learnt the most rudimentary form of agriculture, or attained to the knowledge which would necessarily follow, of the value of a settled habitation, their progress would have been more rapid. This, however, they lacked, as, strange to say, they did the knowledge of the bow and arrow, although possessing all the essentials for its manufacture.

In fact, it is quite evident that the natives have learnt nothing from outside sources; whatever progress has been made has been evolved amongst themselves.

For example, in Arnheim's Land, the peninsula west of the Gulf of Carpentaria, the bamboo, introduced by the Malays (probably accidentally) centuries ago, may now be considered indigenous in that one portion of Australia; but the blacks there have never learned the innumerable uses to which other nations put this valuable growth.

To turn from these prosperous natives to those next in order in the scale of development, we find them dwelling on the inland rivers which flow into Lake Eyre and on the north-west and west coast of Australia. Although so widely separated, and differing much in many of their habits, these inland and coast blacks are on the same plane of intelligence. The country they inhabit would furnish about the same food-supply and has many points of resemblance. Life with them is a far more difficult problem to solve than with their eastern neighbours, and in consequence there is a marked falling off in the number and variety of their weapons and their camp furniture. Still, these natives are by no means without marks of having elevated themselves in keeping with their somewhat depressing surroundings. The western coast of Australia is more sterile than the eastern, and the natives have therefore had less leisure. This is evident from the rougher make of their weapons. One finds little or no ornamentation: all that is made, either by men or women, is for stern use. The spears with six or eight elaborate barbs are absent, the 'possum rugs are exchanged for a few tattered kangaroo skins, and the kangaroo net is unknown. That these west-coast blacks would, under more favourable circumstances, have reached a higher grade is more than probable. Their cave drawings and rude scratchings on the granite mounds prove that they had dormant capabilities. The inland blacks, resident on Cooper's Creek and other interior rivers, have certainly made an advance in the character of their habitations. At the foot of a sand-ridge, generally in the neighbourhood of a permanent waterhole, may be seen a row of objects somewhat resembling large bee-hives. These are the mud hovels of the blacks, their winter quarters, to which they return periodically. These hovels are constructed of interlaced boughs plastered over with clay kneaded up with dry grass. When the keen winter night wind blows across the side plains of this region, the natives first warm the inside by lighting a fire on the sand, then rake the embers out, and the whole family creep in at the low entrance, which is closed up with a sheet of bark. To the northward, circumcision, and also the mutilation of both men and women is practised. This is evidence of the poverty of the country, as amongst the eastern natives no attempt at repressing population was ever known to exist. Amongst the blacks of this grade the "pituri" chewers are found, the leaves of a plant which, after a certain process

akin to fermentation, has a slightly narcotic effect. Most likely it was first resorted to to deaden the pangs of hunger.

The third and lowest class of aborigines inhabit the great area of the western interior. Amongst them the utmost misery and semi-starvation perennially exists. Depending for their water-supply on brackish springs; for their food, greatly on roots and vermin, with an occasional god-send of a kangaroo or some of the larger feathered fowl, it is not surprising that they are destitute of all but the rudest weapons of necessity, and that their scanty camp equipment comprise little more than vessels dug out of soft wood for carrying water across the dry country. So devoid of ingenuity are they that in lieu of the stone tomahawk common to the rest of Australia, they use a flint wedged into the cleft of a stick which they wield like a chisel. They have, however, the common bond which unites all the Australians, the use of the boomerang. They are meagre in stature and their lower limbs are greatly attenuated. In all respects they are a people with whom life is one long, weary struggle for the barest means of existence. The barren desolation of the land in which they live has stamped an indelible brand of misery upon them. Whilst the eastern aboriginal wandered amongst forests, plains and belts of scrub teeming with animal life, camped at night beside a running stream or at the margin of a broad lily-decked lagoon, his countryman of the far western interior starved in a riverless waste of sand-hills, barren mulga scrub, and spinifex (*Triodia irritans*) flats. Scorched in summer by an angry sun in a shadeless land, nipped in winter by the cold south-east wind blowing across level, shelterless country, drinking the nauseous waters of some brackish spring or shallow well, dug on the outskirts of a salt lake, in another thousand years these wretched beings would be no further advanced in their mode of living than they are now or than they were a thousand years ago.

That many of the eastern tribes, probably all, would in time have elevated themselves into a rude civilisation, their superior condition, compared with the desert outcasts of the western interior, proves; for that they originally started from a common origin there can be no doubt, but on a different footing. In their geographical distribution the location was far more happy for some than for others. As things now are, the best races have either dwindled down to a mere handful or are utterly degraded, in either case lost as an ethnological study, without weapons or traditional customs. The only aborigines still to be found uncontaminated by contact with the whites are on the north-west coast, or in the solitudes of the western interior. The destiny of the race was determined with the first footstep of the European.

THE KONDE COUNTRY.*

By the Rev. Dr. MERENSKY.

In 1891 the Rev. Dr. Merensky, of the Berlin Missionary Society, conducted a party of missionaries to the Konde country, at the northern end of Lake Nyasa. They reached the lake by way of the Zambesi and Shire; started from Karonga on September 29th, and founded the station Wangewannshöh on October 2nd. Dr. Merensky describes the water of Lake Nyasa as being clear and of agreeable taste. At its northern end the lake is shallow, and abounds in sandbanks, due to the immense masses of *débris* carried into it by six large rivers. The southern portion of the lake is much deeper, and in places no bottom has been reached at a depth of 200 fathoms. Dr. Merensky maintains that the lake has not changed its level for thousands of years. There is an annual rise, due to the rains, but the difference between the highest level, in April and May, and the lowest, in November or December, scarcely exceeds 3 feet. As a proof that no material change in the lake-level has taken place for ages, Dr. Merensky points to the clearly-marked beach-lines on Monkey Bay, the highest of which, in August, was only 2 feet $4\frac{1}{2}$ inches above the then level of the lake. He found, moreover, that huge *Adansonias*, having a diameter of between 10 and 15 feet, grew only a few feet above the edge of the water at Mponde, at Livingstonia, and in Leopolds Bay. According to Adanson, the age of a tree of such dimensions would be about five thousand years. The permanency of the lake-level is explained by the existence of a ledge of granite which crosses the Shire about 30 miles below the Molomba Lake. Above this barrier the current of the Shire is very sluggish, and this accounts for the gradual silting-up of the small lake just named.



* Report of Paper read at the meeting of the Berlin Geographical Society, July 8th, 1893.

The banks of the Nyasa in the south, south-east, and west, are anything but attractive. Barren, rocky mountains here and there approach the edge of the water, or are separated from it by swamps. The soil is little productive and often sandy. There is a remarkable absence of rivers. On the other hand, the land lying to the north-east and east of the lake, although it presents fewer facilities for commercial intercourse with the interior, is distinguished for its beauty and fertility. The Konde country is shut in by the steep slopes of the Livingstone Mountains, which rise to a height of 10,000 feet. These mountains consist of ancient crystalline rocks, quartzite, hornblende, gneiss, and magnetite. Their steep slopes are almost bare of vegetation, although forests of deciduous trees are not altogether wanting on the slopes facing the lake. Higher up we meet with bamboo thickets, whilst the northern slopes, descending towards the Ruaha, are more abundantly wooded. Within the amphitheatre formed by these mountains, in the centre of the Konde country, there rises the Kiedyo, an extinct volcano, with a crater-lake, cinder beds, and streams of basaltic lava, whilst the forest-clad Rungwe (10,000 feet) forms a buttress of the encircling mountain range on the north.

The Konde country covers an area of about 2000 square miles. It is traversed by six large rivers, fed by numerous springs and rivulets. Of these rivers the Songwe separates the British from the German territory, whilst the Kivira, Mbaka, and Lufira are within the latter.

The country towards the mountains is hilly, but the district bordering the lake consists in the main of a dead flat, flooded for months in the summer, and habitable only in a few localities which rise above its general level. The soil in the hills is a heavy loam. The fertility of the country is due to the distribution of the rainfall. The following are the results of meteorological observations, made at Wangemannshöh in 1892:—

	Mean Temperature.		Rainfall.	
	Fahrenheit.	Inches.	Days.	
January	75·7°	8·78	23	
February	74·7°	14·57	21	
March	72·0°	6·10	21	
April	71·2°	8·31	18	
May	69·6°	1·10	5	
June	67·6°	·39	5	
July	66·6°	1·14	11	
August	68·9°	·24	2	
September	73·4°	·00	0	
October	77·4°	·08	1	
November	78·6°	1·06	11	
December	74·3°	7·20	20	
Year	72·5°	48·97	138	

Violent winds are almost unknown to the west of the Livingstone

Mountains, and this circumstance greatly favours the cultivation of bananas, seven varieties of which are known in the country.

The game is not very varied. Elephants are still occasionally met with in the swamps, as also herds of buffaloes; but hippopotami are numerous, and crocodiles much dreaded. Of other game only zebras and eland antelopes are met with, and that rarely, owing to the dense population.

The people known as Wakonde (Wangonde) really belong to three clans, viz., the Wangonde, around Karonga; the Wanyakyusa, in the centre; and the Wakukwe, towards Mount Rungwe. Linguistically they belong to the family of the Maganja (Anyanjaor Anyasa), which occupies the whole of the country from the Zambesi to the Livingstone Mountains. In the east and west these tribes have been encroached upon by Angoni and Ayawa (Yao). Altogether they number about 100,000 souls. They are more nearly related to the Warori and the Mambwe than to the tribes to the south of the Zambesi. They have occupied their present seats for ages, but are traditionally supposed to have come from the east. They have in a remarkable manner utilised the natural resources of their country. They cultivate Indian bamboos and thus obtain an excellent material for building their houses and stables. Agriculture, and the breeding of hump-backed cattle, are carried on with much success. The disposition of the people is gentle, and we hear nothing of the cruelties so often practised in other parts of Africa. The cleanliness of the houses and village streets is quite remarkable. Trees are planted for ornamental purposes. The tribal government is carried on on liberal principles, and there are no despotic chiefs. Woman is accorded a high position, and legally quite the equal of man. The great defect in the character of the people is thievishness, but among this peaceably disposed people this rarely leads to murder. On the other hand, suicides are rather frequent.

M. CASIMIR MAISTRE'S JOURNEY FROM THE CONGO TO THE SHARI AND BENUE.*

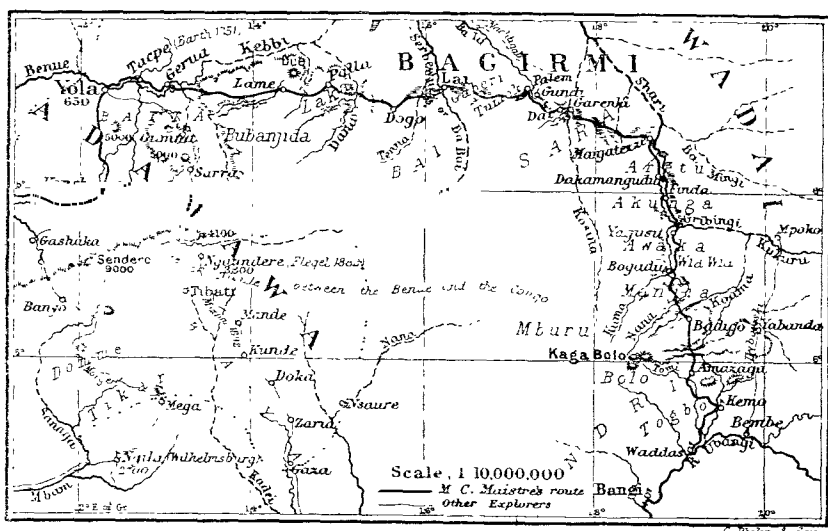
IN the country lying at the back of the German sphere of "Camérons" and between the Rivers Congo, Shari and Benue, which not many years ago appeared as a blank upon our maps, French explorers have recently exhibited a persistent activity deserving of all praise. They have been more successful in opening up new countries and solving geographical problems than their German competitors, and whether this is ultimately

* *Comptes Rendus* of the Paris Geographical Society, 1893, p. 269, with map.

to entail political consequences or not, geographers, at all events, have every reason to congratulate themselves upon the results achieved.

To the late M. Crampel is due the credit of having been the first to cross the water-shed between the Congo and the Shari, an achievement which he paid for with his life. His work was followed up by M. Dybowski. Further to the west Lieutenant Mizon crossed from the furthest point reached by Flegel to the south of Yola, into the basin of the Sanga, one of the main tributaries of the Congo. And now, at a recent meeting of the Paris Geographical Society, M. Casimir Maistre rendered an account of a journey through the three river basins named above, which exceeds in interest either of the expeditions already referred to.

M. Maistre was selected in 1891 by the "Comité de l'Afrique



française" to conduct reinforcements to M. Dybowski, engaged at that time in clearing up the fate of M. Crampel. He left Loango on March 1st, 1891, marched overland to Brazzaville, where he met M. Dybowski on his return home, and then steamed up the Congo and Ubangi, encountering Lieutenant Mizon by the way, and reaching the station of Bangi on June 2nd. A few days afterwards he was at Kemo, where he organised his expedition, and on June 28th he started for the Shari, accompanied by five Europeans, (Béhagle, Clozel, Bonnel, Brunache and Briquez), sixty native soldiers from the Senegal, and one hundred porters. The route chosen by him was more westerly than that followed by Crampel and Dybowski. At Amazaga, the last village of the Ndri or Ndi, whose country extends to the south-west as far as the Sanga, he laid in a stock of provisions, for there was before him an uninhabited

wilderness, lying between Congo and Shari. Here he already found himself outside the great African forest. The soil was a ferruginous loam (laterite), covered with bush. Rivulets and swamps abounded. The Manjia, whose country he now entered, are of the same race as the Ndri. They live in conical huts, are cannibals, and fair agriculturists. At the very first village (on July 31st) he was received with a shower of arrows, but after two more fights, which demonstrated the superiority of fire-arms, the Manjia were glad to make peace. Having traversed the countries of the Wia-Wia and Awaka, M. Maistre, at the beginning of September, arrived at the River Gribingi, which flows through a broad plain, and is actually the upper Shari (Nachtigal's Bahr el Ardhe). Having crossed this river in boats improvised by M. Béhagle, the expedition entered the country of the Akunga, a peaceable, industrious people, who readily bartered provisions for small white beads (bayakas). Here, too, the soil is laterite. The numerous depressions are occupied by swamps or pools, around which grow wild rice and a variety of gaily flowered aquatic plants.

At Manjatezze M. Maistre left the Shari and turned his face westward, for his exhausted resources prohibited a visit to Bagirmi and its new capital Buguman,* or of Bornu, which he might easily have made under more favourable circumstances. The Sara, in whose country he now found himself, are a warlike people, split up into numerous independent communities. Those in the north pay tribute to Bagirmi. They are fine men, 5 feet 10 inches in height; are armed with spears, missile-knives and daggers, and limit their dress to a skin apron. The women wear a fringed belt or go absolutely naked. Millet, maize and ground-nuts are cultivated. The Bahr Sara or Kosinar which traverses their country, was nearly 2 miles wide, and was crossed in forty native boats.

At Palem, on November 7th, M. Maistre found himself close to Gundi, where Nachtigal had camped for two months in 1873. Crossing a sandy plain, densely covered with bush, M. Maistre arrived on November 21st at Lai, a town of six thousand inhabitants, on the Ba Lai, the chief of which was persuaded to sign a treaty placing his town under the protection of France. The Ba Lai, or "river of Lai," is identical with Nachtigal's Logone. It does not bifurcate with the Shari, although after the rain the whole of the flat country lying between the two may possibly be flooded.

The remainder of the journey, as far as Yola, led through wooded hills. At Yola, where M. Maistre arrived on January 1st, 1893, he was able to replenish his stores, through the kind help of the officials of the Royal Niger Company, and on March 23rd he reached Akasa, at the mouth of the Niger.

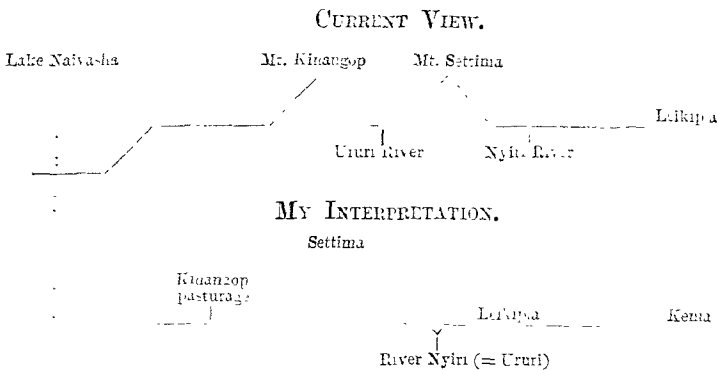
* Bugoman lies on the Shari, due west of the old capital of Massenya.

MR. GREGORY'S EXPEDITION TO MOUNT KENIA.

THE following letter, dated from Kinani, north-east Kikuyu, July 10th, with a postscript dated August 4th, has been received by the Secretary of the Royal Geographical Society from Mr. J. W. Gregory:—

You may perhaps remember that I was permitted last November, by the Trustees of the British Museum, to leave London as naturalist to the Villiers Expedition to Lake Rudolph. When that expedition broke down I went south to Mombasa, and there hastily organised a small expedition of my own. I left Mombasa on March 23rd and hastened *via* Szavo and Machakos to Fort Smith. Thence I went on to Baringo exploring the geology of the great valley of subsidence in which that and other lakes now lie. From Baringo I came to Kikuyu across Leikipia, and am now on my way back to the coast. I expect to reach Europe at the end of September or beginning of October.

I had not expected to do much geographical work in this district, especially as I was unable to get proper instruments; but I have done a little. I have settled several points in the drainage of Lakes Baringo and Hannington, and the small lake to the south-east of the latter. My main work, however, has been on Leikipia and Kenia (or Kilimara). I traversed the former by a new route across the site of the "Aberdare Mountains," or the "Aberdare Kette," of Hühnel, and find that the character of this "chain of mountains" has been misunderstood. From the accounts and maps of Thomson and Hühnel I had expected to find here a double range of mountains separated by the Ururi Valley; but the Ururi is the same as the Nyiri, and the two mountain ranges consist only of a volcanic mass piled up near the edge of the Leikipia escarpment. This may be diagrammatically expressed as follows:—



From Settima I turned to Kenia. I had with me Teleki's *kilingosi*, who took me to the highest point he reached. I got up 3000 feet further, and at about 2000 feet from the summit was stopped by a cornice I dared

not risk alone. I think the mountain is about 19,000 feet high, though my altitudes are all at present quite approximate. Until I reach the coast I have not the tables with which to work them out finally.

Höhnel's aneroids appear to have gone wrong. I have used boiling-point thermometers almost daily in order to keep my aneroid in check. Teleki's description of the Peak of Kenia appears to me by no means accurate. Instead of the "Spitze" being part of the wall of a vast crater full of snow, I find that it is the central core of a greatly denuded old volcano, of which the crater has long since disappeared. I have roughly mapped the southern and western sides of the peak, with its three main glaciers beside the smaller conic glaciers. The glaciers once had a much greater extension than at present. One of the valleys (that by which Teleki went) has a charming set of terminal and one old median moraine. The principal glacier is now re-advancing, though this may be only a seasonal change due to the heavy rains of this year. It has burst through the highest terminal moraine in several places.

I have succeeded in collecting a good set of native names. I have often got the names of the peaks used in the valleys on either side of a ridge. I hope to compile a useful table of the local synonyms.

On my return from Kikuyu I have followed up the Thika-thika, and have settled some points of the watershed of the Tana and Athi; several rivers from the "Athi plains" I find really enter the Tana; while the mapping of the most westerly head-streams of the Tana requires much revision.

Mr. Gregory will address an evening meeting of the Society early next session, and give a detailed account of his valuable observations on the geographical characteristics of the Mount Kenia region.

GEOGRAPHY AT THE BRITISH ASSOCIATION, NOTTINGHAM MEETING, 1893.

THE British Association met at Nottingham from September 13th to 20th. The following were the office-bearers of Section E (Geography):—

President.—Henry Seebohm, Sec. R.G.S. *Vice-Presidents.*—Prof. Bonney, D.Sc., F.R.S.; J. Y. Buchanan, M.A., F.R.S.; Colonel Godwin-Austen, F.R.S.; J. Scott Keltie, Assistant Secretary R.G.S.; Clements R. Markham, C.B., F.R.S.; E. Delmar Morgan; E. G. Ravenstein. *Secretaries.*—Lieut.-Col. Fred. Bailey, Sec. R.G.S.; John Coles; H. O. Forbes; H. R. Mill, D.Sc. (*Recorder*). *Committee.*—Dr. W. G. Blackie; W. M. Conway; H. N. Dickson, F.R.S.E.; E. Heawood, M.A.; Sir Henry Howorth, M.P., F.R.S.; Prof. J. Milne, F.R.S.; H. Yule Oldham, M.A.; Trelawney Saunders; G. E. T. Smithson; Eli Sowerbutts; Dr. H. Owen Taylor; Cope Whitehouse.

In several respects the meetings of Section E were more than usually satisfactory. There were various novel features in the conduct of the Section which added to its popularity without detracting from the serious character of the proceedings. One of these was a discussion with Section C (Geology), which has been specially reported for the *Journal*; another was a change in the mode of exhibiting maps and illustrations, optical projection being largely employed for this purpose. A third attractive feature was an exhibition of geographical paintings similar to those which have been made in previous years. The artist on this occasion was Mr. W. G. Burn Murdoch, and his subject the incidents of the voyage of the *Balæna* toward the Antarctic Regions. A loan of the collection of pictures has been secured for exhibition in the Society's rooms at Savile Row.

The Geographical Section met on four days, and the custom of adjourning from one to two o'clock for luncheon was resumed with satisfactory results, the audiences, both in the forenoon and afternoon sittings, being considerably above the average.

On Thursday, Mr. Seebohm, the President of the Section, delivered his address on the Arctic Basin to a crowded house. Mr. Clements R. Markham proposed a vote of thanks and referred to the present condition of Arctic exploration. Mr. Guy Boothby's description of a journey he recently made across the continent of Australia from North to South called forth some interesting reminiscences from Sir George Bowen, the first Governor of Queensland, who contrasted the condition of that colony, when he undertook its government with only sevenpence-halfpenny in the exchequer, with its present flourishing state. A paper on the islands of Chiloe was read by Mrs. Lilly Grove, F.R.G.S., assistant in the Geological Department of Mason College, Birmingham. Mr. E. G. Ravenstein summarised the recent extension of our knowledge of Central Africa resulting from the various expeditions of the Katanga Company; and the sitting concluded with an illustrated address on "Earthquakes in Japan," by Professor John Milne, F.R.S.

Wednesday was entirely devoted to physical geography. The forenoon was taken up by the discussion on the "Limits between Physical Geography and Geology," which will be printed in our next number. The interest taken in the subject by geologists, as well as by members of the Geographical Section was gratifying, and although some of the speakers were somewhat discursive, and wandered from the lines laid down in the opening address, the general result must be viewed as distinctly valuable. In the afternoon Mr. W. M. Conway described the geography and scenery of the Mustagh Mountains, with lantern illustrations. Mr. J. Y. Buchanan, F.R.S., recounted the first results of a series of observations on the influence of land, water and ice on the temperature of the air, with special reference to the phenomena of

the föhn. Mr. H. N. Dickson submitted the preliminary results of his observations on the temperature and salinity of the water between Scotland and the Farøe Islands carried out in August on behalf of the Fishery Board for Scotland. Dr. H. R. Mill described the general conclusions as to the influence of configuration on the seasonal changes of temperature in the water of the Clyde Sea Area, and also communicated a preliminary note on the configuration of the English lakes. The Report of the Committee on Scottish place-names, drawn up by Sir Charles Wilson, was read by Colonel Bailey, Secretary of the Royal Scottish Geographical Society.

Africa engrossed all the time on Monday. Two reports of committees for special work connected with Africa were read by Mr. E. G. Ravenstein, one giving an account of Mr. J. Theodore Bent's archaeological work at Aksum, the other recording the progress of the study of climatological conditions in Tropical Africa. Mr. Bent's work has already been noticed in these pages, and the brief report of the Climatological Committee will be printed next month. Captain Williams, R.A., addressed a very large audience on the subject of Uganda and its people, laying stress on the potentialities of the race for future development. The discussion which followed was animated and to the point, ending in a hearty vote of thanks to the speaker. The Rev. C. H. Robinson read an extremely popular paper on Hausa Pilgrimages from the western Sudan. He detailed the adventures of a Hausa pilgrim, whom he met last year in Tripoli, returning from Mecca. This man had reached Khartum on his outward journey just after the Mahdi's occupation of the town, and gave a new account of the incidents attending the death of General Gordon. Mr. J. Howard Reid, of Manchester, sent a short paper on the relation of Lake Tanganyika to the Congo, and Mr. Herbert Ward an essay on the influence of environment as displayed in the tribes of the Congo basin. These papers were communicated to the Section in the absence of their authors. Dr. H. Schlichter, who was also absent, sent a series of vertical sections drawn across northern and central Africa, from west to east, at intervals of 4° of latitude, accompanied by a short paper, which was read by one of the Secretaries. These sections form an interesting exposition of our knowledge of the vertical relief of Africa, and will probably be published in the *Journal*. Dr. R. W. Felkin gave an account of a new map he has constructed, showing the distribution of endemic diseases in Africa and their relative intensity. The work of the day was concluded by a learned discourse on Ptolemaic maps in their bearing on the ancient geography of the lower Nile basin, by Mr. Cope Whitehouse, who showed photographs of the maps in question, and of the regions treated of, by means of the optical lantern.

On Tuesday morning Mr. W. S. Bruce and Dr. C. M. Donald read important papers descriptive of their observations while on board the whaling vessels *Balæna* and *Active* in the Antarctic seas, Dr. Donald

also exhibiting a number of fine specimens of southern birds. Elaborate reports by both gentlemen will shortly be published by the Royal Geographical Society. There was a long and animated discussion on the subject of Antarctic exploration. Mr. J. Scott Keltie read a letter from Admiral Sir Erasmus Ommanney, enclosing an appeal from the Australian Antarctic Exploration Committee, in which the advisability of subsidising steam sealers sailing from Australian ports was emphasised. Mr. H. O. Forbes showed the importance of exploration with regard to the discovery of animal remains, and their bearing on a former extensive Antarctic continent. Mr. Coles strongly urged the necessity of further exploration, and started a subscription list, which was liberally subscribed to amongst the audience, in order to supplement the grants which it was hoped would be obtained from various societies to enable Mr. Bruce to spend a year on South Georgia or some other Antarctic island, which he is prepared to do for the mere payment of expenses. Dr. H. R. Mill mentioned some of the problems of physical geography the key to which lay in the Antarctic regions, and supported Mr. Coles's suggestions for further research. Mr. E. G. Ravenstein spoke warmly on the subject; Sir George Bowen characterised the work as of national and more than national importance; Mr. G. J. Symons, F.R.S., showed how meteorology and other sciences would be advanced by such an expedition, and Colonel F. Bailey also supported the scheme. Later in the day the Committee of Recommendations gave a grant of £50 in aid of Mr. Bruce's project of spending a year in Antarctic lands. It is unfortunate that during the proceedings, which were throughout of a most enthusiastic kind, there were no reporters in the Section, and that this practical and useful piece of work was not made generally known to the public. On Thursday afternoon Mr. E. Delmar Morgan read a valuable paper on the recent progress of exploration in Tibet, and Mr. E. Heawood gave an account of the Bengal Duars, where he was engaged for a considerable time in settling a colony of Santals. Mr. B. Bentham Dickenson, of Rugby School, introduced the important subject of the use of the optical lantern in geographical instruction in schools. He gave a demonstration of his methods, and described the working of an association recently formed for promoting the better teaching of geography. Mr. Keltie, Mr. Richardson, Mr. Yule Oldham, and others took part in the discussion, which had unfortunately to be stopped before several intending speakers had an opportunity of addressing the Section. Votes of thanks to the Local Committee were proposed by the President, Mr. Seebohm; to Mr. Seebohm by Mr. E. Delmar Morgan, and to the Secretaries, by Mr. Keltie.

The most gratifying feature of the meeting was the amount of work done by young men who are pursuing geography as a serious study, and are ready when opportunities offer to make it their life-work. This fact promises well for the growth of a British school of geographers as

painstaking, solid, and scholarly as those of any other nation. It has always been the policy of the Royal Geographical Society to promote and assist the scientific study of geography, and, therefore, we feel the greater satisfaction with the signs of advance which are now appearing on every side.

THE NORTH POLAR BASIN.*

GEOGRAPHY, the child of Mathematics and Astronomy, stands in the relation of mother to half a dozen other sciences, which have long ago left the parental roof to establish sections of their own. Like every other science, geography is so closely connected with, and dependent on, its allied sciences that it is impossible to treat of the one without invading the province of the others. No one supposes that the making of maps is the whole duty of the geographer. The accurate delineation of the trend of coast-lines, the courses of rivers, the heights of mountains, the depths of seas, or the position of towns is only the skeleton which underlies the real science of geography.

The study of geography may be divided into various sections, but it must always be remembered that they dovetail into each other, as well as into the allied sciences to such an extent that no hard-and-fast line can be drawn between them. The object of dividing so comprehensive a section as that of geography into sub-sections is more practical than scientific. The classification of facts is an important aid to memory, and introduces order into what might otherwise seem to be a chaos of knowledge.

The foundation of all geography is EXPLORATION; but before the traveller can do good geographical work he must acquire the necessary knowledge embraced in the science of CARTOGRAPHY. This includes a practical acquaintance with the various instruments used in making a survey, the necessary mathematical and astronomical knowledge required for their use, and a familiarity with the accepted mode of expressing the geographical facts that may be acquired on a chart or map. Exploration may then be undertaken with some chance of ultimate success, but the object of exploration must be something more than the filling up of blanks in our maps. Many other subjects must receive attention, subjects which are collectively included in the term physical geography, but which require treatment under different heads. Of these the most obvious is the geographical distribution of light and heat, as well as the more fitful alternations of wind and rain with calm and drought; in other words, the numerous causes which combine to produce climate. Meteorology or CLIMATOLOGY, the geography of the air, is a most important branch of geography in general; and when we come to inquire into the changes which have taken place in the climate of different parts of the Earth's surface, especially those which have affected the Polar Basin, we enter upon a subject which has claimed a large share of the attention of geologists, who have also made a profound study of the geographical distribution of the various kinds of rock which are found on the crust of the Earth. Another sub-section of great importance is the geographical distribution of organic life. The geographical

* Address to the Geographical Section of the British Association, by Henry Seebohm, Hon. Sec. R.G.S., F.L.S., F.Z.S., President of the Section; Nottingham, Sept. 1893. Map, p. 384.

ranges of the species and genera, both of plants and animals, have become a subject of vastly increased importance since so much attention has been directed to the theory of evolution; and the paramount importance of the human race is so great that ethnological geography may fairly claim to be treated as a sub-section apart from the study of the rest of the fauna of a country. Inasmuch as a map with the towns left out is only half a map, the geographer cannot afford to neglect the races of men with which he comes in contact, nor the remains (architectural or otherwise) which existing nations have produced or past races have left behind them.

I propose on the present occasion to elaborate these subjects at greater detail, and, with your permission, to take the Polar Basin as an example.

There is only one Polar Basin; the relative distribution of land and water and the geographical distribution of light and heat in the Arctic region is absolutely unique. In no other part of the world is a similar climate to be found. The distribution of land and water round the South Pole is almost the converse of that round the North Pole. In the one we have a mountain of snow and ice covering—it may be a continent, it may be an archipelago, but in any case a lofty mass of congealed water surrounded by an ocean stretching away with very little interruption from land to the confines of the tropics. In the other we have a basin of water surrounding a comparatively flat plain of pack ice, some of which is probably permanent, but most of which is driven hither and thither in summer by winds and currents, and is walled in by continental and island barriers broken only by the narrow outlets of Bering Strait and Baffin's Bay and the broader gulf which leads to the Atlantic Ocean, and even that interrupted by Iceland, Spitzbergen, and Franz Josef Land. When we further remember that this gulf is constantly conveying the hot water of the tropics to the Arctic Ocean, and that every summer gigantic rivers are pouring volumes of comparatively warm water into this ocean, we cannot but admit that the climatic conditions near the two poles differ widely from each other.

In looking at a map of the Polar Basin one cannot help remarking the curious fact that the North Pole is so very nearly central, and a glance at the southern hemisphere also shows a rough sort of symmetry in the distribution of land and water round the South Pole. It is a curious coincidence if this be only accident.

The history of the

EXPLORATION

of the Polar Basin is a very long and a very tragic story. Much has been done, but much remains to do. The unexplored regions of the Polar Basin may be estimated at 1,000,000 square miles. No part of the world presents greater difficulties to the explorer. Many brave men have perished in the enterprise, and more have only just succeeded in passing through the ordeal of hunger and cold with their lives. For the most part the heroic endurance of the tortures of famine has shown a marvel of discipline, though occasionally the commanders of the expeditions have had to enforce obedience to the verge of cruelty, both in the case of men and of dogs. There are, indeed, a few ghastly stories, but the records of Arctic exploration are records of which any nation might be proud.

Of recent years there has been but little done to explore the unknown parts of the Polar Basin. Adventurous journeys in Central Africa and Central Asia have somewhat eclipsed the exploration of the Arctic regions. Two visits to Greenland cannot, however, be entirely passed by in silence. In the summer of last year an expedition went to the north of Greenland under the command of Lieutenant Peary, succeeded in reaching latitude 82°, and added material evidence to prove

that Greenland is an island. The expedition sailed on June 6th, 1891, steamed up Baffin's Bay and Smith's Sound, and on July 25th dismissed the ship and established themselves in winter quarters in McCormick Bay, on the north side of Murchison Sound, in latitude 78°. They laid in a stock of game for the winter, guillemots and reindeer. A most interesting proof of the successful organisation of the expedition is the fact that Mrs. Peary was one of the party, and was able to accompany her husband on his sledge trip, which started on the 18th of the following April.

It took the party a week in their dog sledges to round Inglefield Gulf, during which they discovered thirty glaciers, ten of them of the first magnitude. During the next three months they explored the north coast of Greenland, as far east as longitude 34° W., when a great bay was reached, which they named Independence Bay, as they discovered it on July 4th. The northern shore of this bay was free from snow and ice. On August 6th they regained their winter quarters in McCormick Bay. On the 8th the steamer arrived, and on the 24th they started for home, reaching Philadelphia on September 23rd. During the sledge journey they travelled for a fortnight at an average elevation of 8000 feet above the sea. Besides their important additions to the map of Greenland, the suggestive fact that the thermometer can rise to 41° F., and torrents of rain can fall in the middle of February as far north as latitude 78°, must be regarded as a valuable discovery.

It was hardly to be expected that so successful a journey should not be followed by a second attempt in order to follow up the discoveries of the first. Peary has started for the north of Greenland with a more carefully-organised staff for a longer expedition, and has already reached his winter quarters. They expect to be absent two years or more. In March they hope to start for Independence Bay, which was discovered on the previous expedition, and there the party will divide, with the object of completing the survey of the coast-line of Greenland by reaching Cape Bismarck, if possible, and at the same time to explore the northern coast-line of Independence Bay, hoping that it may land them further north than the highest point yet reached by any Arctic traveller.

In the summer of 1888 Dr. Nansen was bold enough to cross the continent of Greenland about latitude 64°, reaching an altitude of 9000 feet, and he told his story to this Section in his own simple words on his return. The distance across was about ten degrees, and the highest point was about one-third of the way across from the east coast. If the scientific results were necessarily somewhat meagre, Dr. Nansen established a reputation for bravery and physical endurance, which he hopes to increase by an attempt to reach the North Pole. The *Fram* has already started from Hammerfest, and was telegraphed a few weeks ago from Waigatz Island. The intention is to enter the Kara Sea and to push northwards and eastwards, hoping that the warm currents caused by the great Siberian rivers will enable them to get well into the ice before winter begins. Once frozen into the pack ice, Nansen hopes to be carried by the currents somewhere near the North Pole, and, after drifting for two or three years, he hopes finally to emerge from his ice prison somewhere on the east coast of Greenland. Foolhardy as the expedition appears, it is nevertheless planned with great skill, and its chances of success are supposed to be based upon a sufficiently accurate knowledge of the ocean currents of the Polar Basin.

These currents, so far as they are known, are very interesting. The Mackenzie and the great Siberian rivers flow into the Polar Basin, and the current through Bering Strait is supposed to do the same; but both these sources of supply can only be regarded as of minor importance. Between Spitzbergen and Linnmark, however, the Gulf Stream enters the Polar Basin 300 or 400 miles wide. To compensate for these inward currents, there are two outward currents, one on each

side of Greenland, which, coming from the centre of cold, do their best to intensify the rigours of that mountainous island.

Nansen hopes that the current which carried the *Jeannette* from Herald Island, north of Bering Strait, in a north-westerly direction for 500 or 600 miles, is the same current that flows down the east coast of Greenland, and he bases his hopes upon three facts. First, that many articles from the wreck of the *Jeannette* were found on an ice-floe off the south coast of Greenland three years afterwards; second, that a harpoon-thrower of a pattern unknown except in Alaska was picked up on the south-west coast of Greenland; and, third, that drift-wood supposed to be of Siberian origin is stranded regularly in considerable quantity on the coasts of Greenland. The Norwegian at Hammerfest, about latitude 70°, is dependent for his firewood upon the Gulf Stream, which brings him an ample supply from the Gulf of Mexico, whilst the Eskimo on the Greenland coast, in the same latitude, trusts to a current from the opposite direction to bring him his necessary store of wood from the Siberian forests.

We can only hope that Nansen will find the currents as favourable to his needs, and that so much bravery may be supported by good luck.

By no means the least important physical feature of the Polar Basin is its gigantic

RIVER SYSTEMS.

The rivers which flow into the Arctic Ocean are some of them amongst the greatest in the world.

Some idea of the relative sizes of the drainage areas of a few of the best known rivers may be learnt from the following table, in which the Thames, with a drainage area of 6000 square miles, is the unit :—

9 Thames	equal 1 Elbe (54,000).
2 Elbes	1 Pechora (108,000).
2½ Pechoras	1 Danube (270,000).
2 Danubes	1 Mackenzie (540,000).
2 Mackenzies	1 Yenisei (1,080,000).
2 Yeniseis	1 Amazon (2,160,000).

Perhaps a more scientific classification of rivers would be to call those with a drainage area between 2,560,000 and 1,280,000 square miles rivers of the first magnitude, a category which contains the Amazon alone. There are ten rivers of the second magnitude, with drainage areas between 1,280,000 and 640,000 square miles (Ob, Congo, Mississippi, La Plata, Yenisei, Nile, Lena, Niger, Amur, Yangtse). There are twelve rivers of the third magnitude, with drainage areas between 640,000 and 320,000 square miles (Mackenzie, Volga, Murray, Zambesi, Saskatchewan, Ganges, St. Lawrence, Orange, Orinoco, Hoang Ho, Indus, and Bramaputra). There are more than a dozen rivers of the fourth magnitude, with drainage areas between 320,000, and 160,000 square miles, but none of them empties itself into the Arctic Ocean. They include the Danube, Euphrates, and several of the African and South American rivers. Of the numerous rivers which are of the fifth magnitude, with drainage areas between 160,000 and 80,000 square miles, the Pechora belongs to the Polar Basin. The number of rivers of lesser magnitude is legion, and it is only necessary to quote one of each as an example.

6th magnitude (80,000 to 40,000),	Rhine.
7th	(40,000 .. 20,000), Rhone.
8th	(20,000 .. 10,000), Garonne.
9th	(10,000 .. 5,000), Thames.

There is nothing that makes a greater impression upon the Arctic traveller than the enormous width of the rivers. The Pechora is only a river of the fifth magnitude, but it is more than 1 mile wide for several hundred miles of its course. The Yenisei is more than 3 miles wide for at least 1000 miles, and 1 mile wide for nearly another thousand. Whymper describes the Yukon as varying from 1 mile to 4 miles in width for 300 or 400 miles of its length. The Mackenzie is described as averaging 1 mile in width for more than 1000 miles, with occasional expansions for long distances to twice that size.

The drainage area does not measure the size of the Arctic rivers at all adequately. Though the rainfall of many of them is comparatively small, the size of the rivers is relatively very large, owing to the sudden melting of the winter's accumulation of snow, which causes an annual flood of great magnitude, like the rising of the Nile. Even on the Amur in Eastern Siberia, and on the Yukon in Alaska, the annual flood is important enough, but on the rivers which flow north into the Polar Sea the damming up of the mouths by the accumulations of ice produces an annual deluge, frequently extending over thousands of square miles, a catastrophe the effects of which have been much underrated and never adequately described.

If we assume that the unknown regions are principally sea, then the Polar Basin, including the area drained by all rivers flowing into the Arctic Sea, may be roughly estimated to contain about 14,000,000 square miles, of which half is land and half water. In the coldest part of the basin the land is either glacier or tundra, and in the warmer parts it is either forest or steppe.

Greenland, the home of the

GLACIER

and the mother of the icebergs of the Northern Atlantic, rises 9000 or 10,000 feet above sea-level, whilst the sea between that lofty plateau and Scandinavia is the deepest known in the Polar Basin, though it is separated from the rest of the Atlantic by a broad belt or submarine plateau connecting Greenland across Iceland and the Faroes with the British Islands and Europe. Iceland, Spitzbergen, and Novaya-Zemlia, the latter a continuation of the Ural, are all mountainous and full of glaciers. The glaciers of Southern Alaska are some of the largest in the world. The glaciers and the icebergs have a literature of their own, and we must pass them by to say a word or two about

THE TUNDRA.

The Arctic Sea, which lies at the bottom of the Polar Basin, is fringed with a belt of bare country, sometimes steep and rocky, descending in more or less abrupt cliffs and piles of precipices to the sea, but more often sloping gently down in mud-banks and sand-hills representing the accumulated spoils of countless ages of annual floods, which tear up the banks of the rivers and deposit shoals of detritus at their mouths, compelling them to make deltas in their efforts to force a passage to the sea. In Norway this belt of bare country is called the Fjeld, in Russia it is known as the Tundra, and in America its technical name is the Barren Grounds. In the language of science it is the country beyond the limit of forest growth.

In exposed situations, especially in the higher latitudes, the tundra does really merit its American name of Barren Ground, being little else than gravel beds interspersed with bare patches of peat or clay, and with scarcely a rush or a sedge to break the monotony. In Siberia at least this is very exceptional. By far the greater part of the tundra, both east and west of the Ural Mountains, is a gently undulating plain, full of lakes, rivers, swamps, and bogs. The lakes are diversified with patches of green water-plants, amongst which ducks and swans float and dive;

the little rivers flow between banks of rush and sedge; the swamps are masses of tall rushes and sedges of various species, where phalaropes and ruffs breed, and the bogs are brilliant with the white fluffy seeds of the cotton grass. The groundwork of all this variegated scenery is more beautiful and varied still—lichens and moss of almost every conceivable colour, from the cream-coloured reindeer moss to the scarlet-cupped trumpet moss, interspersed with a brilliant alpine flora, gentians, anemones, saxifrages, and hundreds of plants, each a picture in itself, the tall aconites, both the blue and yellow species, the beautiful cloudberry, with its gay white blossom and amber fruit, the fragrant *Ledum palustre* and the delicate pink *Andromeda polifolia*. In the sheltered valleys and deep watercourses a few stunted birches, and sometimes large patches of willow scrub, survive the long severe winter, and serve as cover for willow grouse or ptarmigan. The Lapland bunting and red-throated pipit are everywhere to be seen, and certain favoured places are the breeding-grounds of plovers, and sandpipers of many species. So far from meriting the name of Barren Ground, the tundra is for the most part a veritable paradise in summer. But it has one almost fatal drawback—it swarms with millions of mosquitoes,

The tundra melts away insensibly into the

FOREST,

but isolated trees are rare, and in Siberia there is an absence of young wood on the confines of the tundra. The limit of forest growth appears to be retiring southward, if we may judge from the number of dead and dying stumps; but this may be a temporary or local variation caused by exceptionally severe winters. The limit of forest growth does not coincide with the isotherms of mean annual temperature, nor with the mean temperature for January nearly so closely as it does with the mean temperature for July. It may be said to approximate very nearly to the July isotherm of 53° F. We may therefore assume that a 6-foot blanket of snow prevents the winter frosts from killing the trees so long as they can be revived by a couple of months of summer heat above 50° F.

The limit of forest growth is thus directly determined by geographical causes. In Alaska and in the Mackenzie Basin it extends about 300 miles above the Arctic circle, but in Eastern Canada the depression of Hudson's Bay acts as a vast ice-house, and the forest line falls 500 miles below the Arctic circle, whilst on the east coast of Labrador the Arctic current from Baffin's Bay sends it down nearly as far again. On the other side of the Atlantic the limit of forest growth begins on the Norwegian Coast on the Arctic Circle, gradually rises until it reaches 200 miles farther north in Lapland, is depressed again by the ice-house of the White Sea, but has recovered its position in the valley of the Pechora, which is rather more than maintained until a second vast ice-house, the Sea of Okotsk, combined with Arctic currents, repeats the depression of Labrador in Chuski Land and Kamchatka.

There are no trees on Novaya-Zemlia. Two or three species of willow grow there, but they are dwarfs, seldom attaining a height of 3 inches. Novaya-Zemlia enjoys a comparatively mild winter, the mean temperature of January, thanks to the influence of the Gulf Stream, being 15° F. above zero in the south, and only 5° F. below zero in the north. The absence of trees is due to the cold summers, the mean temperature of July not reaching higher than 45° F. in the south, whilst in the north it only reaches 38° F.

The Indians of Canada have discovered that when they want to find water in winter it is easiest reached under thick snow, the thinnest ice on the river or lake being found under the thickest blanket of snow. On the same principle the tree

roots defy the severe winters protected by their snow shields, but they must have a certain temperature (above 50° F.) to hold their own in summer.

The influence of the snow blanket is very marked in determining the depths to which the frost penetrates beneath it. Thus we find that a Norwegian writer, alluding to latitude 62°, remarks "that the ground is frozen from 1 to 2½ feet in winter, but this depends upon how soon the snow falls. Higher up the mountains the ground is scarcely frozen at all, owing to the snow falling sooner, and, in fact, if the snow falls very early lower down it is scarcely frozen to any depth." Similar facts have been recorded from Canada in latitude 53°. "On this prairie land, when there is a good fall of snow when the winter sets in, the frost does not penetrate so deep as when there is no snow till late." Another writer a little further south, in latitude 51°, says: "I am safe in saying that the frost penetrates here to an average of 5 feet, except when we have had a great depth of snow in the beginning of winter, in which case it does not penetrate nearly so far."

It is not so easy to explain the boundary line between the forest and the

STEPPE.

There are two great steppe regions in the Polar Basin, one in Asia and the other in America. The great Barabinski Steppe in South-west Siberia stretches with but slight interruptions across Southern Russia into Bulgaria. The great prairie region of Minnesota and Manitoba reaches the Mackenzie Basin, and outlying plains are found almost up to the Great Slave Lake. The cause of the treeless condition of the steppes or prairies has given rise to much controversy. My own experience in Siberia convinced me that the forests were rocky, and the steppes covered with a deep layer of loose earth, and I came to the conclusion that on the rocky ground the roots of the trees were able to establish themselves firmly so as to defy the strongest gales, which tore them up when they were planted in light soil. Other travellers have formed other opinions. Some suppose that the prairies were once covered with trees which have been gradually destroyed by fires. Others suggest that the earth on the treeless plains contains too much salt or too little organic matter to be favourable to the growth of trees. No one, so far as I know, has suggested a climatic explanation of the circumstance. Want of drainage may produce a swamp and the deficiency of rainfall may cause a desert, both conditions being fatal to forest growth, but no one can mistake either of these treeless districts for a steppe or prairie. The

ANTHROPOLOGY.

of the Polar Basin presents many points of interest. On the American coasts of the Arctic Ocean the Eskimo lives a very similar life to the Lapp in Norway and the Samoyede in the tundras of Siberia. These races of men resemble each other very much in their personal appearance, and still more so in their habits. Their straight black hair, with little or no beard, their dark and obliquely set eyes, their high cheek bones and flat noses, and their small hands and feet, testify to their Mongoloid origin. They are all indebted to the reindeer for some of their winter dress and for much of their food, and they all have dogs; but the Eskimo travels only with dogs, and the Lapp only with reindeer, whilst the Samoyede uses both dog sledges and reindeer sledges. They all lead a nomadic life, trapping fur-bearing animals in winter and fishing in summer; they resemble each other in many other customs and beliefs, but they are nevertheless supposed to have emigrated to the Arctic regions from independent sources, and many characters in which they resemble each other are supposed to have been independently acquired.

The various races which inhabit the Polar Basin below the limit of forest growth are too numerous to be considered in detail.

Most zoologists divide the Polar Basin into two zoological regions, or, to be strictly accurate, they include the Old World half of the Polar Basin in what they call the Palaearctic region, and the New World half in the Nearctic region; but recent investigations have shown that these divisions are unnatural and cannot be maintained. Some writers unite the two regions together under the name of the Holarctic region, whilst others recognise a circumpolar Arctic region above the limit of forest growth, and unite in a second region the temperate portions of the northern hemisphere. In the opinion of the last-mentioned writers the circumpolar Arctic region differs more from the temperate regions of the northern hemisphere than the American portion of the latter does from the Eurasian portion.

The fact is that

LIFE AREAS,

or zoo-geographical regions, are more or less fanciful generalisations. The geographical distribution of animals, and probably also that of plants, is almost entirely dependent upon two factors, *climate* and *isolation*, the one playing quite as important a part as the other. The climate varies in respect of rainfall and temperature, and species are isolated from each other by seas and mountain ranges. The geographical facts which govern the zoological provinces consequently range themselves under these four heads. It is at once obvious that the influences which determine the geographical distribution of fishes must be quite different from those which determine the distribution of mammals, since the geographical features which isolate the species in the one case are totally different from those which form impassable barriers in the other. It is equally obvious that the climate conditions which influence the geographical range of mammals must include the winter cold as well as the summer heat, whilst those which determine the geographical distribution of birds, most of which are migratory in the Arctic regions, is entirely independent of any amount of cold which may descend upon their breeding-grounds during the months which they spend in their tropic or sub-tropic winter quarters.

Hence all attempts to divide the Polar Basin into zoological regions or provinces are futile. Nearly every group of animals has zoological regions of its own, determined by geographical features peculiar to itself, and any generalisations from these different regions can be little more than a curiosity of science. The mean temperature or distribution of heat can be easily ascertained. It is easy to generalise so as to arrive at an average between the summer heat and the winter cold, because they can be both expressed in the same terms. When, however, we seek to generalise upon the distribution of animal or vegetable life, how is it possible to arrive at a mean geographical distribution of animals? How many genera of mollusks are equal to a genus of mammals, or how many butterflies are equal to a bird?

If there be any region of the world with any claim to be a life area, it is that part of the Polar Basin which lies between the July isotherm of 50° or 53° F. and the northern limit of organic life. The former corresponds very nearly with the northern limit of forest growth, and they comprise between them the barren grounds of America and the tundras of Arctic Europe and Siberia.

The fauna and flora of this circumpolar belt is practically homogeneous; many species of both plants and animals range throughout its whole extent. It constitutes a circumpolar Arctic region, and cannot consistently be separated at Bering Strait into two parts of sufficient importance to rank even as sub-regions.

Animals recognise facts, and are governed by them in the extension of their ranges; they care little or nothing about generalisations. The mean temperature of a province is a matter of indifference to some plants and to most animals. The facts which govern their distribution are various, and vary according to the needs of the plant or animal concerned. To a migratory bird the mean annual temperature is a matter of supreme indifference. To a resident bird the question is equally beside the mark. The facts which govern the geographical distribution of birds are the extremes of temperature, not the means. Arctic birds are nearly all migratory. Their distribution during the breeding season depends primarily on the temperature of July, which must range between 53° and 35° F. It is very important, however, to remember that it is actual temperature that governs them, not isotherms corrected to sea-level. If an Arctic bird can find a correct isotherm below the Arctic circle by ascending to an elevation of 5000 or 6000 feet above the level of the sea, it avails itself of the opportunity. Thus the region of the Dovrefeld above the limit of forest growth is the breeding-place of many absolutely Arctic birds; but this is not nearly so much the case on the Alps, because the cold nights vary too much from the hot days to come within the range of the birds' breeding-grounds. Here, again, the mean daily temperature is of no importance. It is the extreme of cold which is the most potent factor in this case, and no extreme of heat can counterbalance its effect.

In estimating the influence of elevation upon temperature it has been ascertained that it is necessary to deduct about 3° F. for every thousand feet. The

ISOTHERMAL LINES

are very eccentric in the Polar Basin. The mean temperature of summer is quite independent of that of winter. The isothermal lines of July are regulated by geographical causes which do not affect those of December, or operate in a contrary direction. The Gulf Stream raises the mean temperature of Iceland during winter to the highest point which it reaches in the Polar Basin, viz., 30° to 35° F., whilst in summer it prevents it from rising above 45° and 50° F., a range of only 15° . In the valley of the Lena in the same latitude the mean temperature of January is 55° to 50° F. below zero, whilst that of July is 60° to 65° F. above zero, a range of 115° .

The close proximity of the Pacific Ocean has a much less effect on the mean temperature at Bering Strait, which is in the same latitude as the north of Iceland. The mean temperature for January is zero, whilst that for July is 40° F. The mean temperature for January in the same latitude in the valley of the Mackenzie is 25° below zero, whilst that for July is 55° F. In this case the contrast of the ranges is 40 and 80, which compared with 15 and 115 is small, but the geographical conditions are not the same. Bering Sea is so protected by the Aleutian chain of islands, that very little of the warm current from Japan reaches the straits. It is deflected southwards, so the Aleutian Islands form a better basis for comparison. Their mean temperature for January is 35° F., whilst that for July is 50° F., precisely the same difference as that to be found in Iceland.

The influence of geographical causes upon climate being at present so great, it is easy to imagine that changes in the distribution of land and water may have had an equally important influence upon the climate of the Polar Basin during the recent cold age, which geologists call the Pleistocene period. It is impossible for the traveller to overlook the evidences of this so-called Glacial period in the Polar Basin; and whether we seek an explanation of the geographical phenomena from the astronomer or the geologist, or both, it is impossible to ignore the geographical interest of the subject.

No sciences can be more intimately connected than geography and

GEOLOGY.

A knowledge of geography is absolutely essential to the geologist. To discriminate between one kind of rock and another is a comparatively small part of the work of the geologist. To ascertain the geographical distribution of the various rocks is a study of profound interest. If the geologist owes much to the geographer, the latter is also largely indebted to the labours of the former. The geology of a mountain range or an extended plain is as important to the physical geographer as the knowledge of anatomy is to the figure painter.

The geology of the Polar Basin is not very accurately known, and the subject is one too vast to be more than mentioned on an occasion like the present; but the evidences of a comparatively recent ice age in eastern America and western Europe are too important to be passed by without a word.

In the sub-Arctic regions of the world there is much evidence to show that the climate has in comparatively recent times been Arctic. The present glaciers of Central Europe were once much greater than they are now, and even in the British Islands glaciers existed during what has been called the ice age, and the evidence of their existence in the form of rocks, upon which they have left their scratches, and heaps of stones which they have deposited in their retreat, are so obvious that he who runs may read. Similar evidence of an ice age is found in North America, and to a limited extent in the Himalayas, but in the alluvial plains of Siberia and North Alaska, as might be expected, no trace of an ice age can be found.

Croll's hypothesis that an ice age is produced when the eccentricity of the Earth's orbit is unusually great, has been generally accepted as the most plausible explanation of the facts. It is assumed that during the months of perihelion evaporation is extreme, and that during the months of aphelion the snowfall is considerably increased. The effect of the last period of high eccentricity is supposed to have been much increased by geographical changes. The elevation of the shallow sea which connects Iceland with Greenland on the one hand, and the south of Norway and the British Islands on the other, would greatly increase the accumulation of snow and ice in those parts of the Polar Basin where evidence of a recent ice age is now to be found; whilst the depression of the lowlands on either side of the Ural Mountains so as to admit the waters of the Mediterranean through the Black and Caspian Seas, might prevent any glaciation in those parts of the Polar Basin where no evidence of such a condition is now discoverable. But this is a question that must be left to the geologist to decide.

The extreme views of the early advocates of the theory of an ice age have been to a large extent abandoned. No one now believes in the former existence of a Polar ice cap, and possibly, when the irresistible force of ice-dammed rivers has been fully realised, the estimated area of glaciation may be considerably reduced. The so-called great ice age may have been a great snow age, with local centres of glaciation on the higher grounds.

The zoological evidence as to the nature, extent, and duration of the ice age has never been carefully collected. The attention of zoologists has unfortunately been too exclusively devoted to the almost hopeless task of theorising upon the causes of evolution, instead of patiently cataloguing its effects.

There is a mass of evidence bearing directly upon the recent changes in the climate of the Polar Basin to be found in the study of the present geographical distribution of birds. The absence of certain common British forest birds (some of

them of circumpolar range sub-generically, if not specifically) from Ireland and the north of Scotland is strong confirmation of the theory that the latter countries were not very long ago outside the limit of forest growth.

The presence of species belonging to Arctic and sub-Arctic genera on many of the South Pacific Islands is strong evidence that they were compelled to emigrate in search of food by some great catastrophe, such as an abnormally heavy snowfall, and the fact that no island contains more than one species is strong evidence that this great catastrophe has only occurred once in recent times. The occurrence of a well-recognised line of migration from Greenland across Iceland, the Faroes, and the British Islands to Europe is strongly suggestive of a recent elevation of the land where the more shallow sea now extends in this locality. The extraordinary similarity of the fauna and flora of the Arctic regions of the Old and New Worlds can only be found elsewhere in continuous areas, and, had it not been for the unfortunate division of the Arctic region into two halves, Palearctic and Nearctic, would have attracted much more attention than it has hitherto received.

THE RAINFALL

of the Polar Basin is small compared to that with which we are familiar, but its visible effects are enormous. In Arctic Europe and Siberia it is supposed to average about 13 inches per annum; in Arctic America not more than 9 inches. The secret of its power is that about a third of the rainfall descends in the form of snow, which melts with great suddenness.

The stealthy approach of winter on the confines of the Polar Basin is in strong contrast to the catastrophe which accompanies the sudden onrush of summer. One by one the flowers fade, and go to seed if they have been fortunate enough to attract by their brilliancy a bee or other suitable pollen-bearing visitor. The birds gradually collect into flocks, and prepare to wing their way to southern climes. Strange to say, it is the young birds of each species that set the example. They are not many weeks old. They have no personal experience of migration, but Nature has endowed them with an inherited impulse to leave the land of their birth before their parents. Probably they inherit the impulse to migrate without inheriting any knowledge of where their winter quarters are to be found, and by what route they are to be sought. They are sometimes, if not always, accompanied by one or two adults, it may be barren birds, or birds whose eggs or young have been destroyed, and who may therefore get over their autumn moult earlier than usual, or moult slowly as they travel southwards. Of most species the adult males are the next to leave, to be followed perhaps a week later by the adult females. One by one the various migratory species disappear, until only the few resident birds are left, and the Arctic forest and tundra resume the silence so conspicuous in winter. As the nights get longer, the frosts bring down the leaves from the birch and the larch trees. Summer gently falls asleep, and winter as gently steals a march upon her, with no wind and no snow, until the frost silently lays its iron grip upon the river, which, after a few impotent struggles, yields to its fate. The first, and mayhap the second ice is broken up, and when the starrester of the village sallies forth to peg out with rows of birch trees the winter road down the river to the next village for which he is responsible, he has frequently to deviate widely from the direct course in his efforts to choose the smoothest ice, and find a channel between the hummocks that continually block the way.

The date upon which winter resumes his sway varies greatly in different localities, and probably the margin between an early and a late season is consider-

able. In 1876 Captain Wiggins was frozen up in winter quarters on the Yenisei in latitude $66\frac{1}{2}^{\circ}$ on October 17th. In 1878 Captain Palander was frozen up on the coast 120 miles west of Bering Strait, in latitude $67\frac{1}{4}^{\circ}$, on September 28th.

The sudden arrival of summer on the Arctic Circle appears to occur nearly at the same date in all the great river basins, but the number of recorded observations is so small that the slight variation may possibly be seasonal and not local. The ice on the Mackenzie River is stated by one authority to have broken up on May 13th in latitude 62° , and by another on May 9th in latitude 17° . If the Mackenzie breaks up as fast as the Yenisei—that is to say, at the rate of a degree a day—an assumption which is supported by what little evidence can be found—then the difference between these two seasons would be nine days. My own experience has been that the ice of the Pechora breaks up ten days before that of the Yenisei, but as I have only witnessed one such event in each valley too much importance must not be attached to the dates.

According to the *Challenger* tables of isothermal lines, the mean temperatures of January and July on the Arctic Circle in the valleys of the Mackenzie and the Yenisei scarcely differ, the summer temperature in each case being about 55° F., and that of winter -25° F., a difference of 80° F.

On the American side of the Polar Basin summer comes almost as suddenly as it does on the Asiatic side, but the change appears to be less of the nature of a catastrophe. The geographical causes which produce this result are the smaller area of the river basins and the less amount of rainfall. There is only one large river which empties itself into the Arctic Ocean on the American side, the Mackenzie, with which may be associated the Saskatchewan, which discharges into Hudson Bay far away to the south. The basin of the Mackenzie is estimated at 590,000 square miles, whilst that of the Yenisei is supposed to be exactly twice that area. The comparative dimensions of the two summer floods are still more diminished by the difference in the quantity of snow.

The snow in the Mackenzie basin is said to be from 2 to 3 feet deep, whilst that in the Yenisei basin is from 5 to 6 feet deep, so that the spring flood in the latter river must be about five times as large as that of the former.

Another feature in which the basin of the Mackenzie differs from those of the rivers in the Arctic regions of the Old World is the number of rapids and lakes contained in it. The ice in the large lakes attains a thickness at least twice as great as that of the rapid stream, and consequently breaks up much later. In the Great Slave Lake the ice attains a depth of 6 to 7 feet, and even in the Athabaska Lake, in latitude 58° , it reaches 4 feet. The rapids between these two lakes extend for 15 miles. The ice on the river breaks up a month before that on the lakes, so that the drainage area of the first summer flood is much restricted.

The arrival of summer in the Arctic regions happens so late that the inexperienced traveller may be excused for sometimes doubting whether it really is going to come at all. When continuous night has become continuous day without any perceptible approach to spring an alpine traveller naturally asks whether he has not reached the limit of perpetual snow. It is true that here and there a few bare patches are to be found on the steepest slopes, where most of the snow has been blown away by the wind, especially if these slopes face the south, where even an Arctic sun has more potency than it has elsewhere. It is also true that small flocks of little birds—at first snow-buntings and mealy redpoles, and later shore larks and Lapland buntings—may be observed to flit from one of these bare places to another looking for seeds or some other kind of food, but after all evidently finding most of it in the droppings of the peasants' horses on the hard snow-covered roads. The appearance of these little birds does not, however, give

the same confidence in the eventual coming of summer to the Arctic naturalist as the arrival of the swallow or the cuckoo does to his brethren in sub-Arctic and sub-tropic climates. The four little birds just mentioned are only gipsy migrants that are perpetually flitting to and fro on the confines of the frost, continually being driven south by snowstorms, but ever ready to take advantage of the slightest thaw to press northwards again to their favourite Arctic home. They are all circumpolar in their distributions, are as common in Siberia as in Lapland, and range across Canada to Alaska as well as to Greenland. In sub-Arctic climates we only see them in winter, so that their appearance does not in the least degree suggest the arrival of summer to the traveller from the South.

The gradual rise in the level of the river inspires no more confidence in the final melting away of the snow and the disruption of the ice which supports it. In Siberia the rivers are so enormous that a rise of 5 or 6 feet is scarcely perceptible. The Yenisei is three miles wide at the Arctic circle, and as fast as it rises the open water at the margin freezes up again and is soon covered with the drifting snow. During the summer which I spent in the valley of the Yenisei we had 6 feet of snow on the ground until the first of June. To all intents and purposes it was mid-winter, illuminated for the nonce with what amounted to continuous daylight. The light was a little duller at midnight, but not so much so as during the occasional snowstorms that swept through the forest and drifted up the broad river bed. During the month of May there were a few signs of the possibility of some mitigation of the rigours of winter. Now and then there was a little rain, but it was always followed by frost. If it thawed one day it froze the next, and little or no impression was made on the snow. The most tangible sign of coming summer was an increase in the number of birds, but they were nearly all forest birds, which could enjoy the sunshine in the pines and birches, and which were by no means dependent on the melting away the snow for their supply of food. Between May 16 and 30 we had more definite evidence of our being within bird flight of bare grass or open water. Migratory flocks of wild geese passed over our winter quarters, but if they were flying north one day they were flying south the next, proving beyond all doubt that their migration was premature. The geese evidently agreed with us that it ought to be summer, but it was as clear to the geese as to us that it really was winter.

We afterwards learnt that during the last ten days of May a tremendous battle had been raging 600 miles as the crow flies to the southward of our position on the Arctic Circle. Summer in league with the sun had been fighting winter and the north wind all along the line, and had been as hopelessly beaten everywhere as we were witnesses that it had been in our part of the river. At length, when the final victory of summer looked the most hopeless, a change was made in the command of the forces. Summer entered into an alliance with the south wind. The sun retired in dudgeon to his tent behind the clouds, mis-observed the landscape, a soft south wind played gently on the snow, which melted under its all-powerful influence like butter upon hot toast, the tide of battle was suddenly turned, the armies of winter soon vanished into thin water and beat a hasty retreat towards the pole. The effect on the great river was magical. Its thick armour of ice cracked with a loud noise like the rattling of thunder, every twenty-four hours it was lifted up a fathom above its former level, broken up, first into ice floes and then into pack ice, and marched down stream at least a hundred miles. Even at this great speed it was more than a fortnight before the last struggling ice-blocks passed our post of observation on the Arctic Circle, but during that time the river had risen 70 feet above its winter level, although it was the

miles wide, and we were in the middle of a blazing hot summer, picking flowers of a hundred different kinds, and feasting upon wild ducks' eggs of various species. Birds abounded to an incredible extent. Between May 29 and June 18 I identified sixty-four species which I had not seen before the break up of the ice. Some of them stopped to breed and already had eggs, but many of them followed the retreating ice to the tundra, and we saw them no more until, many weeks afterwards, we had sailed down the river beyond the limit of forest growth.

The victory of the south wind was absolute, but not entirely uninterrupted. Occasionally the winter made a desperate stand against the sudden onrush of summer. The north wind rallied its beaten forces for days together, the clouds and the rain were driven back, and the half-melted snow frozen on the surface. But it was too late; there were many large patches of dark ground which rapidly absorbed the sun's heat; the snow melted under the frozen crust, and its final collapse was as rapid as it was complete.

In the basin of the Yenisei the average thickness of the snow at the end of winter is about 5 feet. The sudden transformation of this immense continent of snow, which lies as gently on the earth as an eider-down quilt upon a bed, into an ocean of water rushing madly down to the sea, tearing everything up that comes into its way, is a gigantic display of power compared with which an earthquake sinks into insignificance. It is difficult to imagine the chaos of water which must have deluged the country before the river beds were worn wide enough and deep enough to carry the water away as quickly as is the case now. If we take the Lower Yenisei as an example it may be possible to form some conception of the work which has already been done. At Yeniseisk the channel is about a mile wide; 800 miles lower down (measuring the windings of the river), at the village of Kureika, it is about 3 miles wide, and, following the mighty stream for about another 800 miles down to the Brekoffsky Islands, it is nearly 6 miles wide. The depth of the channel varies from 50 to 100 feet above the winter level of the ice. This ice is about 3 feet thick, covered with 6 feet of snow, which becomes flooded shortly before the break up and converted into about 3 feet of ice, white as marble, which lies above the winter blue ice. When the final crash comes, this field of thick ice is shattered like glass. The irresistible force of the flood behind tears it up at an average rate of 4 miles an hour, or about 100 miles a day, and drives it down to the sea in the form of ice floes and pack ice. Occasionally a narrow part of the channel or a sharp bend of the river causes a temporary check; but the pressure from behind is irresistible, the pack ice is piled into heaps, and the ice floes are doubled up into little mountains, which rapidly freeze together into icebergs, which float off the banks as the water rises. Meanwhile, other ice floes come up behind: some are driven into the forests, where the largest trees are mown down by them like grass, whilst others press on until the barrier gives way, and the waters, suddenly let loose, rush along at double speed, carrying the icebergs with them with irresistible force, the pent-up dam which has accumulated in the rear often covering hundreds of square miles. In very little more than a week, the ice on the 800 miles from Yeniseisk to the Kureika is completely broken up, and in little more than another week the second 800 miles from the Kureika to the Dickoffsky Islands is in the same condition.

During the glacial epoch the annual fight between winter and the sun nearly always ended in the victory of the former. Even now the fight is a very desperate one within the Polar Circle, and is subject to much geographical variation. The sun alone has little or no chance. The armies of winter are clad in white armour, absolutely proof against the sun's darts, which glance harmlessly on six feet of

snow. In these high latitudes the angle of incidence is very small, even at mid-day in midsummer. The sun's rays are reflected back into the dry air with as little effect as a shell which strikes obliquely against an armour plate. But the sun does not fight his battle alone. He has allies which, like the arrival of the Prussians on the field of Waterloo, finally determine the issue of the battle in his favour. The tide of victory turns earliest in Norway, although the Scandinavian Fjeld forms a magnificent fortress in which the forces of winter entrench themselves in vain. This fortress looks as impregnable as that on the opposite coast, and would doubtless prove so were it not for the fact that in this part of the Polar Basin the sun has a most potent ally in the Gulf Stream, which soon routs the armies of winter and compels the fortress to capitulate.

The suddenness of the arrival of summer in Siberia is probably largely due to the geographical features of the country. In consequence of the vastness of the area which is drained by the great rivers, and the immense volume of water which they have to carry to the sea, the break up of the ice in their lower valleys precedes, instead of being caused by, the melting of the snow towards the limit of forest growth. The ice on the effluents either breaks up after that on the main river, or is broken up by irresistible currents from it which flow up stream—an anomaly for which the pioneer voyager is seldom prepared; and when the captain has escaped the danger of battling against an attack of pack ice and ice floes from a quarter whence it was entirely unexpected, he may be suddenly called upon to face a second army of more formidable ice floes and pack ice from the great river itself, and if his ship survive the second attack a third danger awaits him in the alternate rise and fall of the tributary as each successive barrier where the ice gets jammed in its march down the main stream below the junction of the river accumulates until the pressure from behind becomes irresistible, when it suddenly gives way. This alternate advance and retreat of the beaten armies of winter continued for about ten days during the battle between summer and winter of which I was a witness in the valley of the Yenisei. On one occasion I calculated that at least 50,000 acres of pack ice and ice floes had been marched up the Kureika. The marvel is what became of it. To all appearance half of it never came back. Some of it no doubt melted away during the ten days' marches and counter-marches; some drifted away from the river on the flooded places, which are often many square miles in extent; some got lost in the adjoining forests, and was doubtless stranded amongst the trees when the flood subsided; and some was piled up in layers one upon the top of the other, which more or less imperfectly froze together and formed icebergs of various shapes and sizes. Some of the icebergs which we saw going down the main stream were of great size, and as nearly as we could estimate stood from 20 to 30 feet above the surface of the water. These immense blocks appeared to be moving at the rate of from 10 to 20 miles an hour. The grinding together of the sharp edges of the innumerable masses of ice as they were driven down stream by the irresistible pressure from behind produced a shrill rustling sound that could be heard a mile from the river.

The alternate marching of this immense quantity of ice up and down the Kureika was a most curious phenomenon. To see a strong current up stream for many hours is so contrary to all previous experience of the behaviour of rivers that one cannot help feeling continuous astonishment at the novel sight. The monotony which might otherwise have intervened in a ten-days' march-past of ice was continually broken by complete changes in the scene. Sometimes the current was up stream, sometimes it was down, and occasionally there was no current at all. Frequently the pack ice and ice floes were so closely jammed together that there was no apparent difficulty in scrambling across them, and occasionally the river

was free from ice for a short time. At other times the river was thinly sprinkled over with ice blocks and little icebergs, which occasionally "calved" as they travelled on, with much commotion and splashing. The phenomenon technically called "calving" is curious, and sometimes quite startling. It takes place when a number of scattered ice blocks are quietly floating down stream. All at once a loud splash is heard as a huge lump of ice rises out of the water, evidently from a considerable depth, like a young whale coming up to breathe, noisily beats back the waves that the sudden upheaval has caused, and rocks to and fro for some time before it finally settles down to its floating level. There can be little doubt that what looks like a comparatively small ice block floating innocently along is really the top of a formidable iceberg, the greater part of which is a submerged mass of layers of ice piled one on the top of the other, and in many places very imperfectly frozen together. By some accident, perhaps by grounding on a hidden sandbank, perhaps by the water getting between the layers and thawing the few places where they are frozen together, the bottom layer becomes detached, escapes to the surface, and loudly asserts its commencement of an independent existence with the commotion in the water which generally proclaims the fact that an iceberg has calved.

Finally comes the last march-past of the beaten forces of winter, the ragtag and bobtail of the great Arctic army that comes straggling down the river when the campaign is all over—worn and weather-beaten little icebergs, dirty ice floes that look like floating sandbanks, and straggling pack ice in the last stages of consumption that looks strangely out of place under a burning sun between banks gay with the gayest flowers, amidst the buzz of mosquitoes, the music of song birds, and the harsh cries of gulls, divers, ducks, and sandpipers of various species.

I have been thus diffuse in describing these scenes, in the first place, because they are very grand; in the second place, because they have so important a bearing upon climate, one of the great factors which determine the geographical distribution of animals and plants; and in the third place, because they have never been sufficiently emphasised.

DR. NANSEN'S NORTH POLAR EXPEDITION.

THE following communication from Dr. Nansen has appeared in the *Times*. It is dated on board the *Fram*, Chabarowa, Yugor Strait, August 2nd, 1893:—

Early in the morning, on June 21st, we lifted our anchor and sailed out to sea from Vardo, our last harbour in Norway. The sun just appeared through the fog, and, smiling in the lovely morning light, Norway lay behind us. I was long gazing at this last glimpse of our native land, while it was slowly disappearing under the horizon. Nobody knows how long a time will pass before we shall again see it rise over the horizon, and what hopes will then have been fulfilled and what hopes disappointed! The future always keeps much in store for us that we do not expect. It is, perhaps, fortunate that we do not know it all.

We soon got into the fog, and for four days we sailed through fog over the Barents Sea, until, on the morning of the 25th, we suddenly saw clear blue sky again and bright sunshine—a lovely day on the quiet blue sea.

Later in the morning we saw the first glimpse of Novaya Zemlya over the horizon in the east. It was that part of the island which is called the Goose Land, and we approached it rapidly. We already enjoyed in anticipation the many geese we should shoot and afterwards eat; but alas! the Arctic Sea is rich in dis-

appointment. Hopes are as suddenly broken as they are easily raised. In the afternoon came the fog again, just before we could reach land, and we were again shut out from the world around us. In order to lose no time it was now deemed wise to go out to sea again, and make directly for our first destination—the Yugor Strait—where we should meet our dogs and a vessel with coal, which I had sent from Norway. In addition to the fog, we got, however, contrary winds, and we could move only very slowly forwards in spite of our engines.

For two days we sailed through fog again, until on July 27th we quite unexpectedly met with the first ice. This was not, however, very difficult to get through, and we were shortly in open water again at the other side of the pack. We soon met with new packs of ice, one in the night, which we also passed; but next day we met another which was worse. I navigated the ship through the ice for a long distance; the floes lay tighter and tighter, and there was much big and heavy ice. Then, just at the worst moment, the fog came again, and I did not think it advisable to sail further, as it is best to see where you are going when you navigate through difficult ice, otherwise you might easily make mistakes, and get beset so that it might take days, or even weeks, to regain what you have lost. The fog got denser, and the ice tightened around us, and our hopes were not very bright; there were, at all events, many miles before we could reach open water. Then suddenly, in the night, the fog lightened, it became clearer again, and we could now see from the crow's nest that we had open water to the east. It was certainly a good distance off, and the ice was heavy and difficult; but we must get through—and through we went, and were once more in open water. The *Fram* is a splendid ship for ice navigation, and is as easy to handle and steer between the floes as a boat. She has already given me many a glad moment, when I have seen from the crow's nest how well she behaves, and how strong she is. With a feeling of safeness, I let her quietly run with full speed in between the big heavy floes; she breaks them under her with almost no shaking, no sound in the vessel herself.

Now we steered eastward through open water as quickly as steam would carry us, and on Saturday evening (July 29th) we anchored here in Yugor Strait, outside the small place Chabarowa, where a few Samoyed families live in their tents. A few Russian merchants come in the summer to sell brandy and other things to the natives, and take skins, furs, and oil in exchange.

We were at once met by a boat. The first man who came on board did not look much like a Samoyed, he looked more like a Norwegian. I understood it was my man Trontheim, who had brought my sledge-dogs from the Ostiaks, in Siberia, to this place, where he had now been waiting for me for a month. A little after the new year he left Tiumen, in Siberia, on the most important errand of buying thirty good sledge-dogs or more for me, and bringing them here to Yugor Strait to meet me in July. He went to the Ostiaks, on the River Soswa, where the best sledge-dogs in Western Siberia are to be had. There he bought forty dogs, as he thought some of them might be lost on the way, and he was certainly right, as five have died by various accidents. From the Soswa River he travelled over the Siberian Tundra, then through the Ural Mountains, then over the vast flat plains again until he came here with the dogs, travelling at last with the sledges over the bare ground, over grass and stones, as is the custom here, where they travel with sledge and reindeers in the summer as well as in the winter. Trontheim has carried out his task very well, and as a reward he will get the golden medal of King Oscar, which I have brought with me for him. Now it only rests with us to make good use of the dogs. They are nice-looking animals, white, black, and grey, with pointed nose and standing ears, good tempered, and easy to manage. But against strange dogs they are furious; they almost killed a Samoyed dog which

they got hold of yesterday; it would have been torn to pieces had I not saved the poor creature.

As to the ice, Trontheim brought good news. Yugor Strait had been open since July 3rd, and there should not be much ice in the Kara Sea according to what some Samoyeds, who had been out fishing in that direction, had reported. The only sad news was that our small vessel, the *Urania*, with coal, had not arrived. This is very bad, as we wanted to load our ship with as much coal as possible now we have no longer any need to be afraid of heavy seas. We were, however, prepared not to find the vessel here, as we ourselves had met the ice so early. She is only a sailing vessel, and not built for ice navigation. Thus she will not be able to break her way through the ice, and must find openings to get through, which may take her some time. We look eagerly out for her, but if she does not arrive before we are ready to start we shall have to sail without the coal.

As soon as we had got the necessary sleep, Captain Sverdrup and I started in the oil launch through the Yugor Strait north-eastwards towards the Kara Sea in order to see how the ice was there, and also to look out a way for the *Fram* through the Strait, as it is very shallow in many places not yet known. Thus we suddenly discovered the bottom under us whilst we were going ahead full speed along the middle of the Strait. There was only a few feet of water, and we feared we should not get over even with the launch. It was, however, only a small shallow, and we came at once into deeper water again; but there are many such places, and great care has to be used when sailing in these shallow waters, where the charts are very far from being accurate. I intend to let the oil launch go in front of the *Fram*, sounding all the time wherever I can, and when I think it necessary. This I shall also do along the Siberian coasts, where the sea is very shallow, and where we shall probably often have to go, with only a few feet of water under our keel, in order to get inside the ice lying along the coast.

When we came with our launch to the north-eastern end of Yugor Strait, after having passed among drifting ice-floes all the way, we got a good view from some small hills over the Kara Sea eastwards. We saw that there was certainly much ice on the horizon; but there was a good deal of open water between this ice and the land, and we could easily go with the *Fram* along the coast eastward, or, rather, south-east. Thus the prospect for our progress was good. The Kara Sea, which I had feared would be the worst job of all to get through in time, seemed to be better than its reputation. With these good tidings we returned to our ship. On the way we ran, however, with full speed on a stone on the bottom. One wing of our propeller was broken, and we had to go the long way back only with one wing.

We have been engaged in cleaning the boiler of the *Fram*, repairing some tubes, etc., which had been broken in the engines, filling fresh water into the boiler and into our water-tank, etc. In the meantime we have not altogether abandoned the hope that the vessel with coal may come before we sail. I am, however, anxious to get eastward as soon as possible, as it is an important thing when you have to do with drifting ice to take advantage of every favourable chance at once, as, if you wait, the ice is quickly altered, and the chance may be lost. We shall, therefore, stop no longer here than till everything necessary is ready. Then, taking our precious dogs on board, saying good-bye to Trontheim and our Samoyed friends, and thus breaking this last communication with the civilised world, from which our last letters can be sent home, we sail eastward into an unknown future.

My present intention is to steer eastward along the Siberian coast until we reach the mouth of the Olenek River, east of the Lena Delta. I shall keep as near as possible to the coast wherever there is much ice, as there is generally more open

water along the coast than in the ice. If there is time, and a good opportunity should offer itself, I shall go into the mouth of the Olenek, as some other twenty-six dogs are waiting for us there. As the sledge-dogs from Eastern Siberia are generally known to be better than the West Siberian ones, Baron Toll, the Siberian traveller, who is now in Siberia, proposed to me to let some dogs wait for us there too, so that if I should happen to pass I may go in and take them. If I do not want so many dogs, I can change those I have got here in Jugorski Strait for the better ones there, should they prove to be better. The Russian Nicolai Alexandrowich Kelch made me, through Baron Toll, the generous offer to arrange the matter of the dogs at his own expense, and also to establish some stores (depôts) of provisions on the New Siberian Islands. By Baron Toll's help twenty-six dogs were bought from the Tunguses, and sent to the mouth of Olenek River; a Norwegian Torstensen, who happens to live in Siberia, has brought them there, and is, as far as I know, now waiting for us. A small expedition has also been sent to the island Kotelný, the most western of the New Siberian Islands. On this island two depôts of provisions will be left, one on the north-west coast, and one on the south-west coast. It is on Baron Toll's proposal that these stores of provisions are arranged there. As he says, they can do no harm, but it is not probable that we shall want them. Nobody knows, however, what might happen, and had De Long, of the *Jeannette* expedition, had some such stores of provisions on the New Siberian Islands, the expedition would certainly not have met such a sad fate; and I think Toll is right.

After having passed the Olenek River, we shall go northward, along the west coast of the New Siberian Islands, as far as we can in open water. I hope to be there in the beginning of September. It may be that we shall meet with unknown land or islands to the north-west of Kotelný, and possibly there may be open water along the coasts there. If so, I shall, of course, use it as best I can. But when we can get no further, there is nothing left except to let the *Fram* get beset in the ice, and be carried along northward or north-westward by the current, which, according to my opinion, must run in that direction in those regions.

Then there will probably pass a long time before we are drifted across the unknown polar region, and into open water again, or to some coast from which we can return home. In this time there will be nothing heard from us. But when years have passed, I hope you will some day get the news that we are all safely returned, and that the knowledge of man has advanced another step northward.

The following additional information is contained in a telegram from "the Secretary of Nansen's North Polar Expedition," who accompanied it to Chabarowa.

On the evening of the 23rd, a stop was made, and the apparatus tried for bringing up water, constructed by Professor Pettersen of Stockholm. Specimens were taken from depths of 20 to 120 metres, and the contrivance worked to Nansen's complete satisfaction. Afterwards perfectly satisfactory measurements of temperature were taken, and experiments carried out for testing the quantity of salt contained in the water by Tornøe's apparatus. Rung's sounding instrument was tested and compared with the ordinary lead, giving good results. General satisfaction was felt with the ship's ice-navigating qualities, winding its way through the floes like an eel. When the way was barred astern, she went full speed ahead, and blocks of ice of over 100 tons weight swung round, glided to one side, or broke in two, without the impact being particularly noticed on board. On the 31st, Blessing (the doctor) was on shore making botanical researches, and collected a good number of plants for pressing. Nansen made geological investigations, finding a number of fossils, while Scott Hansen carried out magnetic observations till mid-day of August 1st.

On the 3rd, the dogs were taken on board, and Nansen, Sverdrup and Troutheim, went for a sledge drive, using eight dogs. Though the sledge was heavy and the ground bare, they went along as fast as a quick trot of a horse, and the dogs were pronounced by Nansen to be excellent. On August 6th, some Samoyeds coming from the east, stated that they had seen the *Fram* 120 miles to the north-east, sailing along Yalmal, between the ice and the land.

Dr. Nansen writing to the Secretary of the Society from Chabarowa, says, "I have got a new man, Bernt Bentsen, sailor from Tremsø; so we are now thirteen."

ON THE TEACHING OF PHYSIOGRAPHY.*

By P. KRAPOTKIN.

WHEN Professor Huxley introduced, twenty-three years ago, the name and the subject of Physiography, his intentions were certainly excellent. Natural sciences were almost entirely excluded at that time from the schools. The teaching of geography stood very low: political geography, so-called, was a mere collection of names, and an entirely subordinate subject; and physical geography was a collection of information, too abstract, too incoherent, too wide, and too superficial at the same time, to be of any use in education. Under the name of Physiography natural sciences were, so to say, smuggled into the schools. And by showing how the study of Nature may be approached, and methods of scientific observation may be rendered familiar by examining things close at hand, Professor Huxley has undoubtedly rendered an immense service to this country. He has brought about a far-reaching reform.

However, the very form which physiography assumed in his well-known text-book, and especially later on in schools, shows that the reform was not thorough enough. I need not speak here of Professor Huxley's "Physiography"; every one knows its invaluable merits and its obvious disadvantages, its wonderfully clear explanations of natural phenomena, its beautiful anatomy of the spring, or of the volcano, and its want of a general constructive conception of the phenomena of the globe. I need not speak either of the merits of this or that other text-book, because the time is coming when another further reform in the same direction will become absolutely necessary. What is required now in school is, not to give *some* notions of Nature in connection with the physical features of a given locality, but to convey a thorough knowledge of the Earth, as a part of the Universe—not a mere introduction to the study of Nature, but that study itself. And the question is, How to carry on this study?

Heimatskunde is now in great vogue: but the more one thinks of it, the more one grows convinced that if it might have answered its purpose fifty years ago, especially in some remote village, lost in the Black Forest mountains, it answers its purpose no more in our own times of railway civilisation and world traffic.

We cannot prevent our children from getting some general knowledge of the Earth, even at a very early age. They eat oranges and bananas, which do not grow in our latitudes; and many of them see those growing in the hot-houses of Kew, amidst quite unwonted surroundings. At the age of six they already know "the ship of the desert," the ugly crocodile of the Nile, the dog which drags sledges in the

* Opening address, delivered on April 19th, 1893, before the Teachers' Guild Conference, held at Oxford.

far north, and the dog which used to find Italian boys, lost in the snows of the St. Bernard Pass. The books, the illustrated papers, the tales which pass through our children's hands, tell them stories of distant lands, peopled—not with fairies, but with black men, whom Livingstone loved and Stanley dilled; they speak to them of countries glaring under a tropical vegetation, or buried in snow, and of distant men, strangely dressed and strangely featured. At the age when we used to live by imagination in fairylands, they live by imagination as midshipmites on journeys to Australia, as travellers in the dark continent, as settlers on distant islands. And if there is still in our slums a considerable mass of children who, on being taken to a suburb, and on seeing a blooming apple-tree, wonder at “the daisies on the tree”—still some sort of knowledge of the wide world begins to penetrate, and will penetrate more and more, even into the slums.

In short, there is no period in the life of our present children during which their knowledge of the Earth might be limited to the study of their own locality. The *Erdkunde*—i.e., the knowledge of the Earth as a whole—flows from all sides into their minds, and we are bound to accept the fact, and to speak to them of the Earth as a whole, from their earliest age—in the primary school and in the secondary school, as well as in the University, and after the University.

The study of one's own locality has undoubtedly an immense importance in education; but this importance seems to me to lie elsewhere. The study of one's own corner can *not* be used for the study of Nature altogether. It must be used simply as a means for giving a more concrete form to the acquired knowledge, and as a means of acquiring knowledge through personal work and personal observation. Every boy and girl, as soon as they know enough of elementary geometry for measuring angles and distances, ought to be able to trace angles on the ground, and to make the map of a pond or of a brook, with the aid of the compass and their own paces. Not in order to become geographers, but to help them to understand concretely what a map means; to give a better comprehension of geometry itself, and to immensely facilitate the comprehension of all further developments of mathematics and physics. Every girl and boy ought to know the chief plants of their meadows, their kinship to other plants of the same family, or allied groups, and the distinctive features of each order. They ought to know many of the animals as well, and especially the insects, and learn to observe their habits. All this would contribute to give them a more concrete conception of what they hear and learn about distant lands.

This is the proper part of the *Heimatskunde* in education; but if you trust to it more than that, you fall short of your aim. To speak to a pupil of the distribution of rainfall in the British Isles, *à propos* of the water which flows under London Bridge, is as artificial and irrational as to develop the laws of friction of liquids, or those of the elasticity of solids, in connection with the same bridge. These laws, as well as the distribution of climates on the Earth, must be studied for themselves, not *à propos* of some feature of a local landscape.

In short, under the present state of our civilisation, the conception of the Earth as a whole, and of the variety of its climates, scenery, and inhabitants, unavoidably penetrates into the minds of our children, and we must give them notions of the Earth and the universe from the earliest stages, up to the highest ones, in accordance with the gradual development of their intelligence; and we must utilise our neighbourhood, not for conveying knowledge of the Earth—this would be an utterly artificial method—but for giving a *concrete* conception of the facts learned by the pupil, and especially for promoting spontaneous study. In this sense, *Heimatskunde* ought to be carried on, parallel to *Erdkunde*, through all three stages of education.

Turning to the present state of education in physiography in the schools, it is most pleasant to ascertain that in the elementary schools the study of Nature stands, as a rule, on a tolerably good basis. The same remark has already been made by the Geographical Society's Commissioner* as regards the teaching of geography; and opinions seem to be pretty well agreed upon this subject. There are, among those who have undertaken the great mission of conveying to our children the first notions of the universe, many women and men who undertook the task in full earnest. Although poorly supported in their endeavours by a mass of indifferent parents, and although finding but insufficient sympathy in a society which values the services rendered to it by the salaries it pays, they do their best; and very many of them succeed in conveying to our children, both in the Kindergarten and the elementary school, a good deal of sound knowledge and good scientific methods of observation.

It is evident that there is still room for improvement. More knowledge of natural sciences among elementary teachers is one of the great desiderata of the moment. However, when we see the eagerness with which the teachers seize every opportunity for acquiring more of that knowledge, it seems that what is most wanted now is to give them more opportunities for widening their knowledge in science, more evening lectures, more free courses delivered throughout the country, beyond the great centres, by volunteers in biology, geology, geography, and so on; and also more summer excursions wherever a naturalist or a geographer happens to spend his holidays. All these could be easily realised, especially if the Teachers' Guild and other similar bodies took the initiative in the matter.

At the same time a great deal ought to be done by the parents themselves. They must be thankful to the teacher who gives to their children the first notions of science, and systematises the knowledge they acquire. But it would be foolish on their behalf to rely upon the teacher alone. No amount of organised teaching can supplant the first impulse towards love of nature which must come from the parents themselves. The German school is often spoken of in this country with great praise. But the school in Germany is only a part of the system of education. The amount of excellent and cheap books and periodicals for home education, and the numbers of societies which have recently been started in Germany for developing the taste for natural history collections, for freshwater and marine aquaria and terraria in private houses, for topographical studies and the like, among amateurs, must also be taken into account. Such societies—not for furthering the development of science but for rendering its results and methods accessible to a wide public—could easily be founded, and the teacher would find them of great help in his task.

In short, what is wanted to improve elementary education is not so much a change in the system as a further perfection in carrying out the existing system. A great deal of such improvements can be achieved through a general development of taste in natural sciences. As to the remainder, they entirely depend upon improvements in the secondary schools and the university.

Things stand quite differently with secondary education in the middle schools. Here, the naturalists are unanimous in recognising it; everything is to reform.

In very many schools of this country physiography is the only means for conveying to the learner some knowledge of Nature. No physics, no chemistry, no botany, no zoology are taught in those schools, and instruction in all these is

* J. S. Keltie's 'Geographical Education'; Report to the Council of the Royal Geographical Society. London (John Murray), 1885.

thrown upon the shoulders of the teacher of physiography. His pupils have no idea of heat and its mechanical laws, of its propagation and conversion, and the physiography teacher is supposed to instruct them in all that, while he speaks of the west or east wind which blows over the school-room, or treats of the circulation of the atmosphere. His pupils do not know what a chemical compound is, and he must speak of the composition of the rocks and sea-water, and explain the atomic theory, while he tells to his pupils where kitchen salt is taken from. Their knowledge in the physiology of plants is *nil*, and he must explain how plants feed, what they absorb from the soil, and reject in the atmosphere, and how their protoplasm works. They know not one law of mechanics, and they are invited to understand the mechanism of earthquakes, of glacier motion, of sea and air currents!

If the teacher follows Professor Huxley's text-book, he is supposed to address pupils who do not know that the source of a river lies higher than its mouth, and who hesitate in finding out where is north and south; but, after a few explanatory remarks about these utterly elementary matters, he is already supposed to show them a hyetographical map of the British Isles, to explain to them how "air is drained of moisture," and how "a table-land, or high plain surrounded by mountains" will influence the distribution of rainfall over a country. All knowledge of Nature, the one which is good for a child, and the one which can be understood much later only, is thus supposed to be conveyed incidentally in an unsystematic haphazard way.

In the hands of a well-educated teacher, excellent results may be, and are obtained from such *causeries* in the elementary schools. Like conversations about Nature, being intended to stimulate the desire of knowing something, and to test the various aptitudes of the children, the method answers to the purpose; but in the secondary school, education in science can *not* be left to the hazards of taste and impulse. It must be systematised. To give systematic knowledge is, in fact, the chief duty of this division of the school.

An attempt at conveying such a systematical knowledge has been made in that remarkable work, the 'Realm of Nature,' by Dr. H. R. Mill. I find no adequate terms to express the pleasure I have myself derived from the philosophical and yet plainly worded definitions of the author, and from reading paragraph after paragraph of this well-planned little book. But the teacher who would take this book for his own guidance, and who, as always, ought to know much more than what he intends teaching—very much more—ought to be possessed with as wide an encyclopedic and thorough knowledge of several great branches of science as the author himself should be, and this would mean to require the impossible from a secondary-school teacher.

The fact is, that we cannot eschew the necessity imposed upon us by the development of science, industry, and civilisation as a whole, of educating our children in natural sciences in the proper way. The knowledge of the movements of masses—the foundation of all natural sciences—must be conveyed in its proper shape, that of mechanics, with the aid of geometrical figures and simple algebraic formulæ, not only as it is given in the introduction to physics in all Continental schools, and especially in France, but with a deeper insight into the subject, otherwise it will be superficial knowledge of very little value. The study of the moods, laws and transformations of molecular energy must again be conveyed in its proper shape of physics, also with a thorough knowledge of the mathematical expressions of the laws, and with laboratory work. And the study of atomic energy must be conveyed in the form of chemistry, again with laboratory work, and with a thorough study of the laws of chemical transformations. What sort of a generation are we preparing for the future struggles, and the further development of industry

and science, if we deny to our children the very elements, the very basis of every education? A general review of the realm of Nature, of the Cosmos, including organic life, man, and man's ideals and institutions, will certainly be required. But its proper place will be at a much later stage, when a general review of knowledge already acquired in various separate branches, will have to be made. By the end of secondary education, and during university studies, such a review would be invaluable. Then, and then only, would it be properly understood, but not before the elements of each separate science have been mastered.

I know, however, and by no means will minimise, the chief obstacle to this necessary reform. It lies in the pseudo-classical education, which is now considered as the proper foundation of secondary education, and which leaves no time for the study of the world we live in; no time for familiarising the pupil with the methods of scientific research. A discussion upon the relative merits of the two rival systems of education would be out of place here; but there are two or three points, at least, which I am bound to mention as having a direct bearing upon my subject.

First of all, the present system of classical education was born at a time when the knowledge of Nature could be borrowed from the study of antiquity only. It was a sound and necessary reaction against monastic scholasticism. It was a return to our mother Nature. To return to the Greek spirit meant a return to Nature—to Natural Science; to scientific methods instead of verbal discussions: to natural Art instead of conventional art; to the freedom of municipal life instead of the slavery of eastern despotical states. This made the force, the historical meaning, and the inestimable merits of the mediæval return to the study of antiquity. In reality, this movement meant the beginning—the dawn of modern Natural Science. But now the parts are reversed. Science can be studied in Aristotle no more; it must be studied in Newton and Mayer. And those who neglect Newton for Aristotle stand now in the same position as the adversaries of classical education stood five hundred years ago. They are for Words against Science.

Another fact which strikes every one who thinks about education is, the immense difference between the amount of knowledge which was required in olden times, and the amount required now. He who knew geometry five hundred years ago was a learned man; now, every carpenter must know geometry. He who knew then what lay beyond the Black Sea was a man of extraordinary learning; now, we go for a sea-air cure to New Zealand, for a bicycle trip to Hami, and for a holiday to Spitzbergen. The limits of the known world have been widened; so also those of knowledge. Our generation was considered as educated enough when we knew elementary geometry and elementary algebra; but the coming generation will find its education very imperfect if the boy and girl of eighteen are not able to understand at least the methods of differential and integral analysis, if not to use these instruments of analysis as we now use the rules of arithmetic.

Such a knowledge can be acquired only on the condition that spontaneous work becomes the basis of education in all branches of the school curriculum; and if fifty years ago it could be said that natural sciences afforded no discipline to the young mind, that they did not open a sufficiently large field for the pupil's own work, such a reproach can be maintained no longer. Not even as regards biological sciences, which not long ago were merely descriptive, but now have also elaborated the methods for promoting research and discovery as educational exercises.

And finally, a third reproach to natural sciences must be mentioned, the more so as it brings me back directly to my subject. Natural sciences, it is said, do *not* give to education the human character which they ought to give. This is true; and the objection remains in full force until now. However, it depends entirely upon ourselves to make of these a most powerful instrument for conveying human

education as well. The ancient Greeks did not separate Man from Nature. And the divorce between human sciences—history, economy, politics, morals—and natural sciences has been accomplished entirely by ourselves, especially during our century, and by that school which kept the students of Man in gross ignorance of Nature, and the students of Nature in ignorance of Man.

This artificial separation is, however, done away with every day. We return to Nature. We return to the Greek spirit which conceived Man as a part of the Cosmos, living the life of the whole, and finding his greatest happiness in living that life. The universal revival of the love of Nature, which is a prominent feature of our own times; the application of the methods of natural sciences to sciences dealing with Man and his mind; and finally, the poetical conception of the grand infinite Universe, which more and more penetrates our poetry, our art, and our science, are proofs that the divorce *is* coming to an end. Geographers have especially contributed to destroy the screens which separated the two branches of science, isolated from each other by the University. Humboldt's 'Cosmos' is the work of a geographer: and the geographical work which is most representative of our own times—the 'Géographie Universelle' of Elisée Reclus—gives a description of the Earth so thoroughly intermingled with that of Man, that if Man were taken out of it the entire work would lose its meaning—its very soul.

This growing tendency removes the last objection against natural sciences becoming the very foundation of education. Man, his institutions, his language, his knowledge, and his morals, are now taken as parts of the great Cosmos, and treated as such.

This digression was necessary in order to support my next proposition, namely, *I cannot conceive Physiography from which Man has been excluded.* A study of nature without man is the last tribute paid by modern scientists to their previous scholastic education.

But physiography, including Man, returns to its origin, the *Erdkunde*, the study of the Earth and all what is upon it. Shall we, therefore, return to the Physical Geography of old? The spring first; then the stalactites and the stalagmites; the volcanoes, the movements of the Earth's crust, the distribution of mono- and di-cotyledons, and the distribution of human races? Certainly not, because we can do better.

The first thing which strikes the geographer as he looks upon the Earth as a whole is, not so much the diversity of the landscape and characters of its separate parts, as the well-defined types of certain definite kinds of landscape and scenery. Here is for instance the great plateau of East Asia, the backbone of the continent, a part of the oldest continent, Eurasia. We see its monotony: its want of salient topographical features: its lazy rivers and brackish lakes; its cold winter and its scorching hot summer; the migrations of its animals south-west and north-east; its populations driven at certain dates of history by the rapid desiccation, through the Dzungarian gate, towards the lowlands of Asia and Europe; their lazy life, their monotonous songs, their immense federations. We have in it a well-defined feature, a living whole. And thought immediately evokes the idea of another grand plateau in the New World, with its salt lakes, and cañons, its herds of migrating buffaloes, its Indians retaining the clan organisations of old, and, amidst them, the irruption of the pioneer's waggon, and the Pacific railway crossing the wilderness. And thus we see the plateau of Asia Minor, and those of Africa their physical similarities, and the variety of their floras and faunas, of their historical destinies and their meaning in modern times. Here is thus one salient feature of the Earth's surface, making itself a wide subject full of meaning for separate study, in which study geology, climatology, biology and history complete

each other, in order to impress upon the mind one distinct and dominant feature of the architecture and the life of the Earth.

Then, following the courses of the rivers, we have the plains, high and low, which surround the plateaus. I see there the plains of my mother-country, covered with cornfields as far as the eye can reach; the groves of graceful birches, and the meadows richly adorned with a flora not yet modified by man; the poor log-houses in the villages, and the village communities at work; and on a map, guiding myself simply by the orography of country, I trace the extension of glacial drift and loess, and delineate the famine-stricken regions with almost as much security as the statistician. I read the history of the country written in its rivers in the proximity of the Jungarian gate on the other side, and in those other plains which only wait for colonisers to be covered with corn-crops. Then I compare these plains with those of Yorkshire and Lancashire, placed between the highlands and the Channel, having the densely-peopled parts of Europe at their side, and the tempting ocean in the west. Then I compare them with the plains of Germany, the *puszters* of Hungary, the South Siberian steppes, the Pampas of South America. And again, out of these separate landscapes, diversified by their geographical positions and their surroundings, another great feature of the Earth's surface—the high plains and the low plains—fixes my attention, engraves itself in my memory.

The same with Alpine regions—such as those of Switzerland, the Altai, the Caucasus, and that other quite different type, represented by the central Pyrenees or Transcaucasia. The same with the Lake regions, which stretch through Canada, North-western England, Scandinavia, and Finland, and again represent a well-defined type of the Earth's scenery, originated from a certain well-defined group of agencies, and playing its definite part in the history of mankind. The waterless deserts of Africa, Arabia, and the Transcaspiian territory; the great African and Siberian forest-region; the tropical and the Arctic archipelagoes; the lowlands of the Ganges and the Nile; the tundras of the far north, and so on, appear again as definite features of the Earth's surface.

In a word, there are *types* of landscape and scenery on the Earth's surface as there are types of animals and plants, each of them representing a definite group or physical causes which have acted to produce the result, and each of them playing a definite part in the distribution and destinies of organic life, as well as in the growth and development of separate civilisations. With these types we ought to familiarise our learners in order to convey to them a correct general impression of the world we live in. This review and analysis of the different types of scenery ought to be, in my opinion, the leading feature in the teaching of geography in the secondary school. When this has been done, and when the learner's education in mechanics, physics, and biology has sufficiently progressed, then a general revision of the movements of the atmosphere, the ocean and the Earth's crust would come as a necessary conclusion; and the learner's mind being sufficiently nurtured by that time to take interest in economic and political topics, a review of the sub-divisions of mankind into economic regions and states, with an analysis of their institutions and mutual relations would find its proper place.

It is evident that throughout such teaching all that is possible should be done to convey a concrete idea of the different types described by the geographer. The excellent collections of coloured landscape pictures, published in both a large and a small size by Hölzel in Vienna, and giving a really scientific representation of the various types, would be of great use; the collection only requires to be further completed. As to books, I should especially recommend the reading of original descriptions of travels. Our youths do not read enough of those charming and

deeply impressive and highly instructive records of travel of which all literatures—and especially the English literature—possess such a wealth, especially from the last century and the beginning of the present. They ought to be selected, reprinted, and widely circulated. So also such classical works as Humboldt's 'Ansichten der Natur,' Ritter's monographs upon the camel, the tea-tree, and his lectures on general *Erdkunde*, and the like. We are too much afraid to give to our youths such works as they are not yet prepared entirely to understand; while it is exactly from such works that they are most liable to draw the poetical love of Nature, the desire of knowing more about her mysteries, the very dim light with which some parts of the work are surrounded, awakening the thirst of further knowledge, and surrounding Nature with the poetry which led our best naturalists to their researches.

I hardly need to insist upon the necessity of promoting practical work and experiment by all possible means, and need only mention how much is achieved even now by some modest physiography teachers in this direction. In some schools actual experiment on a modest scale is performed in order to explain various features of the Earth's surface, and immense interest is awakened in the classes when the origin of mountains is shown by means of strata of clay, or when the origin of valleys is illustrated by heaps of sand; or weather charts are compiled from data given in the daily papers; or records of meteorological instruments are kept by the pupils; or, again, the routes of Arctic expeditions are traced on maps from the data given in the traveller's record; while in other schools rough orographical models are made out of clay. The importance of such work, and its stimulating and educational effects are so evident, that I need not further insist upon this subject.

And, finally, a good deal could be done in the way of travelling, even with all the obstacles which are put in the way by railroad and hotel expenses. Young people are not extravagant in their requirements, and can travel with little outlay. Moreover, a good deal in the way of reducing expense could be done by a sort of federation of schools for this special purpose. In fact I do not see why, during the Easter holidays, the boys of a London school wishing to visit the Lake district, could not go and hang their hammocks in some school building in Cumberland for the holiday week. A great deal in this direction is already done in Norway and in Caucasia. Schoolboys' travels are a regular feature of education in both countries, and the amount of valuable materials gathered by the boys of the upper classes of the secondary schools, and especially by the pupils of the teachers' seminaria of Caucasia, as well as by such schoolmasters as have the chance of staying in remote and unexplored mountain districts, can be seen from the excellent year-books recently published by the School Administration of Caucasia.

It is also evident that similar excursions, and even more distant journeys, ought to be a regular part of university education. Summer excursions like those which are made at the summer meetings of Messrs. Geddes and Thomson at Edinburgh, cannot be too warmly recommended. They certainly will contribute to develop a taste for geography in the schools, and they will widen the knowledge of those who may later on become teachers. But this brings me to university education.

In relation to this, I cannot too much insist upon the fact that the best and the surest means for raising the standard of secondary education in any subject is to raise the standard of university education in the same subject. In thousands of ways, direct and indirect, it is the university which affixes its stamp upon the education of a country. It is the high standard of university education in Germany, and the considerable numbers of young men receiving university education, which have so immensely improved the secondary education in Germany, not only by

providing the *real schulen* and gymnasia with good teachers, many of whom love their own subject, but also by creating a whole literature of excellent text-books, of reviews of science in all its branches, accessible to the most modest purse; of popular reviews and popular books, of reviews for promoting lecture and laboratory experiments in the middle-class schools; of cheap atlases, which other countries have to reprint as they are unable themselves to produce anything as good or as cheap, and so on. All the luxury of appliances for geographical education which we have admired at the Geographical Society's Exhibition, and can now study at our leisure at the rooms of the Teachers' Guild in London; so also the flood of thoroughly scientific popular literature and the flow of science into industry which we now see in Germany, are the direct outcome of her university education. Austria is another instance in point. The presence of Professor Penck at Vienna has given that wonderful impulse, both for exploration and in education, which we now admire in Austria; and the generation of students working under Dr. Penck's guidance will undoubtedly mark a new departure in the development of geography in the country. If Oxford had had fifty years ago a Ritter occupying one of its chairs, and gathering round him students from all the world (Elisée Reclus went on foot to Berlin to follow his lectures), it would be this country, not Germany, which would keep now the lead in geographical education.

Each science must be taught in concentric, ever-widening circles. So it must be done with geography. The student who has learned the fundamental facts in the middle school, and has been accustomed there to scientific methods of reasoning, will have a wide series of new questions developed before him in the University. He will have to study, and partly aid in the discovery of, the *laws* which determine the different features of the Earth's surface—for there are such laws; the laws of the plateaus, the plains, the continents; the laws of distribution of land and sea; the laws of spreading and inter-penetration of floras and faunas; the laws of the circulation of the hydrosphere and the atmosphere; the laws of the growth and migrations of civilisations.

It is evident that independent research must lie at the very foundation of all studies. No matter how restricted the domain explored by a student, no matter which branch of science he has chosen, personal exploration and personal work, *in contact with free Nature*, develop the young man's or woman's intelligence incomparably more than years of study from books, or even in the laboratory. All men of mark whom I know, or knew, among geographers, have had the opportunity of doing such independent exploration in their early years; while it is to distant voyages that this country owes Darwin, Wallace, Hooker, and so many others of her glories.

It seems astonishing, therefore, that so little is being done in this direction especially in this country which possesses such an immense commercial fleet and so many pleasure-yachts. When one remembers the epoch-making explorations of simple Norwegian whalers who opened the Kara Sea and the North Siberian route some twenty years ago, or when one thinks of Scoresby, one cannot but ascribe to indolence the fact that scores of young explorers are not taken every year on board of the ships of this country cruising in all latitudes and longitudes. But there is much work to be done at home as well. And when I see the amount of useful information collected every year by the student explorers of Dr. Penck in Austria, or by Russian students in Russia, I cannot but think that the young naturalists of this country are extremely stinted in opportunities for research. The little that has already been done for furthering the study of geography in the universities is already bearing its fruits. But let university education develop freely in this branch, and you will soon see its effects reflected upon the whole of the secondary education given in this country.

I conclude as I began. My task was to express the desiderata of a geographer who sees in his science a powerful educational instrument, and treats it, in its higher stages, as a philosophical review of knowledge acquired by different branches of science. It now remains with the teacher to see which of these requirements is realisable at once, with the slender means at his disposal, and within his own range of action, and which must be left to the slow change of public opinion.

LUIGI BRICCHETTI ROBECCHI'S JOURNEYS IN THE SOMALI COUNTRY.*

Up till the memorable journey of the brothers James into the Ogaden country in 1885, our knowledge of the interior of Somaliland was in the main derived from conflicting native reports. Quite recently a very considerable amount of geographical exploration has been effected there by Italian explorers, some of whom are still in the field. Signor Robecchi, after a short visit to Harar, in 1888, crossed the maritime region between Obbia and Alula in 1890, and in the following year succeeded in traversing the whole of the country between the east coast, and Berbera on the Gulf of Aden. In the same year (1891), Baudi di Vesme, starting from Berbera, succeeded in reaching Īme, a district on the upper Webi; whilst Ugo Ferrandi made his way to Baideia on the upper Jub. Further information of the highest interest is likely to be forthcoming from other Italian explorers still in the field. Prince Eugenio Ruspoli, who started from Berbera in June 1891, is reported to have arrived at Logh, on the Jub; whilst Captains V. Bottego and Grixoni, who left Berbera at the close of last year, have succeeded in reaching Ganana, above Logh. Captain Grixoni, in April last, returned to the coast (Barawa) and forwarded fresh supplies to his companion, who has thus a fair chance of "settling" the Jub, the only African river of importance the sources of which have not as yet been discovered. Considering the great extent and importance of these Italian explorations, it is to be regretted that not one of the travellers named appears to have checked his itinerary, by astronomical observations. At all events, their reports, as far as published, give no indication of such observations having been made, and the position of Bari on Professor Dalla Vedova's map has been adopted from the map of Mr. James, who determined its latitude.

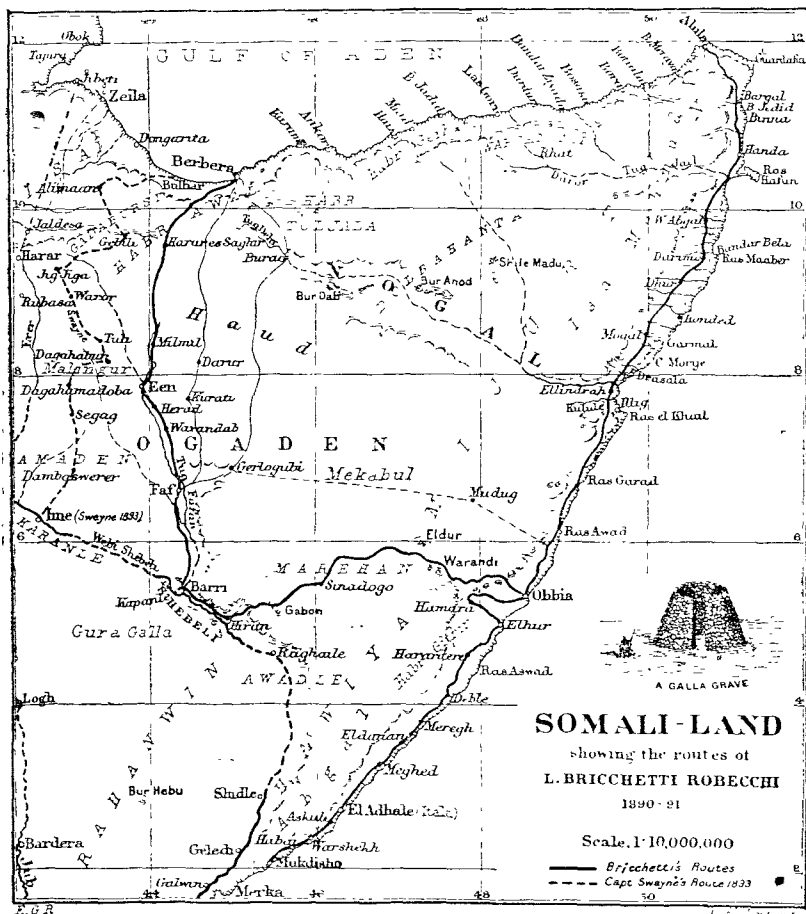
Signor Robecchi started on the first journey which we propose to deal with, in 1889. The Italian gunboat *Volturmo* landed him at Obbia on April 8th, 1890. He met there with a friendly reception on the part of Sultan Yusuf Ali. Obbia is a poor place, with an open roadstead. There are two stone houses and thirty-three huts.

Leaving Obbia for the north, the explorer crossed the sandy dunes, which fringe the coast and, keeping at some distance from it, traversed a region of nummulitic limestone, covered here and there by sandy ridges, generally bare, but not lacking localities affording rich pasturage. Water can be obtained everywhere by digging;

* From the *Bollettino of the Italian Geographical Society*, 1891, pp. 265-286, 601-828; 1893, pp. 355-384, with maps by G. Dalla Vedova. Compare also the 'Itinerario del Viaggio da Obbia ad Alula' and 'Tradizioni storiche dei Somali Migurtini raccolte in Obbia dall' Ingegnero L. Robecchi Bricchetti (sic);' published by the Italian Foreign Office, Rome 1891. Our sketch-map also shows Captain Swayne's route to Īme.

and along the coast there are numerous wells. Gigantic ant-hills of grotesque shape form a conspicuous feature of the landscape.

On nearing Ras el Khail a camp was formed on a vast plateau, where kraals were numerous and game abundant. Signor Robecchi paid a visit to Illig, on the coast. It occupies the bottom of a natural harbour, shut in by cliffs, and is inhabited by about two hundred Isa Darod and Mahra Arabs from Sokotra, whose huts are scattered along the beach, or perched upon the rocks. This place carries on a considerable trade, exporting annually from fifteen to twenty thousand sheep and



goats, fifty tons of butter, as also dried or salted sharks, of which about four thousand are caught every year.

Crossing the Kulule, a perennial stream, and a succession of limestone ridges, supporting a rich vegetation, and frequented by game, Signor Robecchi, on June 20th, entered the famous Wadi Nogal. It presented itself as a broad vale, bounded by hills, and traversed by a stream of limpid water, which only in places disappears below a bed of sand. This favoured valley separates the southern Somali country, which is comparatively level, from the more hilly northern Somali country.

Crossing a succession of wadis and torrents, separated by plateaus of limestone or clayey soil, quite adapted to the cultivation of durra, and abounding in acacias and aromatic plants of every kind, Signor Robecchi reached the district of Bandar Bela, near the mouth of Wadi Darimo, and not far from Ras Maäber. There are here three villages with about a hundred huts. The inhabitants export dried shark, butter, sheep, and goats, as also mats, cord, and wicker-baskets of their own manufacture.

The Yiber, an outcast people, live in the interior among the Isa Mahmud. Several curious customs are observed with respect to them. The first Yiber who arrives in a kraal after the birth of a male child is presented by the parents with some cotton-stuff, a sheep or a goat, in return for which he presents the baby with a wooden amulet, to be worn round the neck. A similar exchange of presents takes place on the occasion of a marriage. Still another outcast people was observed by the Italian explorer. They live along the coast, dwell in mat-huts, carry no arms, have no boats, and subsist on crustacea and stranded fish. These people have no traditions; they are not negroes, Gallas, or Somalis, but speak the language of the last, and appear to be a remnant of the Ichthyophagi of the ancients. Further evidence of a race which in a bygone age inhabited this coast is presented in numerous so-called "Galla graves," which are built up of unhewn stones without mortar, and have the shape of tumuli, nuraghi, cubes, or parallelepipeds. The tumuli, or nuraghi, have a diameter of about 10 feet, and rise to the same height. Signor Robecchi was assured that in one of these "graves" there was found the skeleton of a man who must have been 6½ feet in height.

The route from Bandar Bela to the northward led through a difficult country, and past numerous conical and table-shaped hills. The vegetation included tamarisks, aloes, and superb oleanders, and game abounded. On the sixth day the explorer reached Wadi Jael, which enters the sea to the west of Ras Hafun, and proceeding northward, at no great distance from the coast, passed the villages or districts of Handa, Binna, Bandar Jedid, and Bargal. Of these villages Handa is the oldest. It has about four hundred inhabitants, and exports annually about five hundred sacks of frankincense, besides mats, &c. Binna is inhabited by Mahra from Sokotra; Jedid ("newland") was only founded in 1886, whilst Bargal was established about thirty years ago, and now boasts of three stone houses and a school.

Ultimately Signor Robecchi crossed the hills at the back of Cape Guardafui, the stony soil of which supports an abundance of aromatic plants, and on August 11th he arrived at Alula. He remained there twenty days, the guest of a son of Yusuf Ali, of Obbia, and then returned home by way of Aden.

The climate of the region thus traversed for the first time by a European, is described as agreeable, and Signor Robecchi considers that his countrymen might profitably engage in a trade in myrrh, frankincense, aloes, and other products yielded by the country.

On January 14th, 1891, Signor Robecchi left Europe, bound for the third time for Somali Land. He intended to land at Obbia, but the heavy sea prevented this, and he was thus compelled to go on to Zanzibar. After some misadventures he found himself at Mukhdisho (Madisha). The governor of Shangani was favourable to his projects, but the people of the Somali quarter (Hamarwen) were as strongly opposed to them, and a hostile collision took place. Blood was shed, but blood-money was duly paid, and at last, on April 23rd, Signor Robecchi was able to take his departure. On the very same day he had another fight, near Warshekh, but he happily reached El Adhale (Itala), the first station established by the Italians in the Somali country. Thence he kept to the vicinity of the coast, as far as

Elhur, a small place belonging to the Sultan of Obbia. The road followed thus far had not proved attractive. All was low and sandy, with poor thorn scrub, relieved only occasionally by a few patches of verdure. At Endanane the aspect of the country improved, and between Elhur and Hamara the path led over fertile hills, abounding in aromatic plants, and past fields of durra, beans, and cotton. At Hamara there are several small salt lakes.

Turning back to the coast, Signor Robecchi reached Obbia on May 20th. His reception by the Sultan was most cordial, but he strongly objected to his visitor going inland. In the end, however, Signor Robecchi was able to depart with sixteen camels, two hundred goats, and thirty-four men, making straight for the Webi. He crossed the country of the Merehan, who are Mohammedan fanatics and glory in killing an infidel. Their country is a tableland, lying between 1500 to 2000 feet above the sea, and covered with a dense growth of mimosas, acacias, and other aromatic and resinous plants—a very “sea of verdure.” In the centre of this country, near the wells of Sinadogo, there lies a small lake, embedded among the most luxuriant vegetation. The country swarms with game of every description, including rhinoceroses, elephants and lions, giraffes and zebras, leopards and antelopes.

On reaching the Webi, Signor Robecchi once more found himself among friendly Hawiya. This river traverses a broad plain, and after rains it grows to a width of 300 feet, and its brownish waters rush along with great violence. Both crocodiles and hippopotami are found in it. The Adoni, who dwell on its banks, are the freed slaves of the Karanle Somalis, and cultivate cotton, sesame, durra, beans, and melons.

At Barri, Signor Robecchi came upon the route followed by Mr. James. It was his intention to follow the Webi as far as Harar, but the hostilities between the Karanle and Amaden compelled him to proceed to Faf and up the Fafan Torrent. At Warandab, on August 11th, he met Prince Eugenio Ruspoli coming from the north, and soon afterwards he reached Een, a great religious centre of the Somali country, and the seat of one of the most powerful sects (*tarika*) of the Moslems. These sectaries occupy quite a number of “houses” along the Benadir Coast and the Webi. They own much land and cattle, and exercise a great influence.

From Een Signor Robecchi proceeded by way of Milmil to Berbera, where he arrived on August 30th, 1891.

THE MONTHLY RECORD.

THE SOCIETY.

Educational Lectures.—As will be seen from the prospectus inserted in the present number, Dr. H. R. Mill, the Society's Librarian, will give a course of twelve Educational Lectures at the London Institution, Finsbury Circus, on successive Tuesdays, at 6 P.M., beginning on October 3rd. Readers of the *Journal* are requested to assist in making these lectures known as widely as possible.

EUROPE.

Survey of Windermere.—In the beginning of September Dr. H. R. Mill and Mr. E. Heawood spent five days in completing the sounding of Windermere.

Their work on the other large English lakes was referred to on p. 163. Windermere is the largest of the English lakes, being more than 10 miles in length, and in some places over 1 mile in breadth. Eighty sections were made in order to determine the direction of the contour lines of each 50 feet of depth, the total length of these sections being 36 miles, and the number of soundings taken amounting to eight hundred and sixty, the work involving the hauling of 15 miles of line. Superficially Windermere is divided into three clearly distinguished parts. The northern division is 4 miles long, on the average about $\frac{3}{4}$ mile wide, and contains only a few small islands near the shore. On the west side the coast is usually entire, but on the east facing the prevailing wind it is much eroded by wave action. This stretch is the deepest, the greatest sounding obtained being 219 feet. There is reason to believe that the maximum depth may be 20 or 30 feet greater, but if so the patch where such depths occur must be very small indeed. The area deeper than 200 feet measures 1 mile by $\frac{1}{2}$, and the area below sea-level (the surface of the lake stood at 129 feet) was a long strip $3\frac{1}{2}$ miles long and averaging $\frac{1}{3}$ mile in width. The central division is 1 mile long and $\frac{1}{2}$ mile wide. It is divided by Belle Isle into two narrow channels, and the water in each channel is less than 25 feet deep for a distance of $\frac{1}{2}$ mile. A fall of level of about 16 feet would uncover a ridge cutting the lake into two parts. The southern division is long, narrow, and tapering. The average width is $\frac{1}{2}$ mile, the length about $5\frac{1}{2}$ miles. The greatest depth found here was 144 feet. If the surface were lowered to sea-level this stretch would show two shallow lakes; the northern one, $3\frac{1}{2}$ miles south of the end of the sea-level contour in the northern division, measuring 1 mile in length and $\frac{1}{3}$ mile in average breadth; the southern, $\frac{1}{4}$ mile away, being $\frac{1}{2}$ mile long and $\frac{1}{5}$ mile wide. A large proportion of the bed of Windermere is covered by stiff plastic clay, white, pink, or brown in colour, and all the rocky promontories and islands show unmistakable marks of ice-action. Temperature observations of great interest were made in the lake.

Physical Observations in the Skagerrak.—Professor Otto Pettersson of Stockholm has sent us a few notes of the work done on the physical conditions of the water in the Skagerrak this autumn which are very interesting when compared with those obtained by Mr. H. N. Dickson at the same time in the North Atlantic. The Swedish Hydrographic department, for which Professor Pettersson acted, made observations in the Skagerrak near the end of the channel of very deep water which runs round the west and south of Norway. By means of Professor Pettersson's new non-conducting water-bottle it was found possible to determine the temperature with certainty to $\frac{1}{20}$ th and approximately to $\frac{1}{100}$ th of a degree centigrade (say $\frac{1}{10}$ th and $\frac{1}{50}$ th of a degree Fahrenheit), and to detect small maxima and minima at great depths which could not otherwise be satisfactorily determined. The observations showed that the Norwegian Deep contained a mass of water at the temperature of about $42^{\circ}\cdot 5$ Fahr., on the surface of which floated a layer 10 fathoms thick with an average temperature of 54° . To illustrate the abruptness of the transition from the warm upper layer to the cold mass it is sufficient to point out that the water at the surface was 19° Fahr. warmer than that at the bottom (360 fathoms), and that 14° of this change occurred between the depths of 5 and 10 fathoms. A precisely similar arrangement was found in 1890. It is interesting to note that this is identical with the arrangement of summer temperature in a deep freshwater lake but quite different from that of the sea-water lochs of the west of Scotland. Danish observations were made simultaneously with the Swedish, and the German authorities also took part in the work, Professor Krümmel of Kiel making a series of observations in the Western Baltic. The great want in order to arrive at a

correct knowledge of the seasonal conditions of the sea on the west of Europe is now a series of winter observations, and these Professor Pettersson has arranged for in the Skagerrak.

Glacial Action near the Lake of Constance.—In *Globus* (Bd. lxiv., No. 6), Dr. Sieger, of Vienna, gives an account of a geological excursion in connection with the Geographical Congress at Stuttgart. The route followed was from Biberach to Schaffhausen, covering a region on the outskirts of the Alps which presents peculiar features from the complicated action of the old glaciers of the Rhine and the Lake of Constance. The excursion was made under the guidance of Professor Penck, who surveyed the district during 1891 and 1892, and some of whose results have not hitherto been published. Interest centres chiefly round the evidence of the occurrence of three glacial periods instead of the two usually assumed, the formation of lakes during the last ice-period, and their relation to the Lake of Constance, and, finally, the great variety of channels for the escape of glacier water and water confined by ice.

Geographical Names in the Iberian Peninsula.—Professor Adam Kristoffer Fabricius in two memoirs intended for an international Congress of Orientalists to have been held in Lisbon last year, describes the first invasion of the Scandinavians or Norsemen into the Spanish Peninsula in 844 according to Arab narratives, and indicates the acquaintance which the Scandinavians possessed of that country up to the eleventh and thirteenth centuries according to the Sagas and written documents of the northern peoples. The chief records are those of the travels of St. Olaf from 1013–1015, of Sigurd in 1107, both *en route* for the Holy Land; and of Bishop Peter de Hamar and Andrew Nicolasson, who accompanied the Princess Christina, daughter of Hako of Norway, to the Court of Alphonso X. of Castille, in 1256–1273. In those memoirs Professor Fabricius puts on record, or corrects, many geographical names. Of Latin *Hispania* the Norsemen made *Yspania*, *Spania*, *Spanialand*, *Span*, *Spánaland*, *Spánland*, *Spanlönd*, thus designating all the Iberian Peninsula except Galicia or *Galizuland* or *Jakobsland*, land of St. James or of the Apostle *Saint Jago*. *Far* designates Ferrol, *Tög*, the Tagus. The names of *Ringsfjördr*, *Gristupollar*, *Vilhjálmbær*, *Tettafjördr*, *Seljupollr*, *Gunnvaldsborg* and *Karlsá*, must be sought for, according to Professor Fabricius, not on the west coast of France but on the coast of Spain. *Ringsfjördr* would thus be in the Bay of Biscay. *Gristepolle* would be Castropol in Asturia; *Vilhjálmsby*, Villamea, to the north of the River Eo; *Tettafjördr* the Bay of Betanzos or *Flavium Brigantium* in the south east of Coruña; *Seljepolle*, Guardia or *Cilnorum*, at the mouth of the Minho; *Gunnvaldsborg*, Tuy, destroyed by Olaf. *Karlsá* is *Gades*, *Gadis*, *Cadiz*, from *Karl* “the man,” after the 9-foot statue that so greatly impressed the Norsemen in the country of the *Blámenn* or unbelieving Moors, not far from *Njörvasund* or *Narvése*. This name, from *Njörfa*, *Njörva*, *Nörvasund* *Nor* (Anglo-Saxon, *nearn*; English, *narrow*), is applied to the Straits of Gibraltar, also called *Stólpasund*, *Erkúles Stólpar*, columns of Hercules. *Falland* is sometimes the Low Countries, at other times the Kelt country, more particularly Normandy in France. Lisbon is *Lissibon* and Aljezur or Alcacero-Sal, *Alkassi* or *Alkassa*. *Serkland*, or the “country of the Saracens” may be the north of Africa or Andalusia. *Formintera*, *Ivita*, *Manörk*, the Balearic Islands. *Savre* is perhaps Sarrasin, to the south of Burgos, designated *Byrgs*; *Vallident* or *Valdelikt*, Valladolíd; *Tillet*, Toledo; *Sibillia*, Seville. The Arab writings studied by Professor Fabricius, and the geographical denominations used therein, are better known. Thus *Sidóna* or *Shidunah*, is the present Medina Sidonia, but it was

also called *Palestina*, as *Hispalia* or *Ishbilia* (Seville) was sometimes called *Emessa* and *Damask*—celebrated Oriental geographical names being often transferred to western places.

Linguistics of the Caucasus.—Baron Uslar's great linguistic work on the languages spoken in the Caucasus continues to appear. The fifth volume, devoted to the Khyurkilin language, is now out at Tiflis. This language is spoken in the district of Darghi and the highlands of Kaitak, and has many dialects, of which the Khyurkilin dialect has been studied by the late Baron Uslar. His work contains a detailed grammatical sketch of the language; its phonetic peculiarities are described, with many examples, and its different parts (nouns, adjectives, etc.) are treated in turn. Many proverbs, fables, anecdotes, tales, and songs (with a Russian translation) are given next, and the work is concluded by a vocabulary, with indications relative to kinship with other languages spoken in Daghestan.

Coast Changes in South-west Schleswig.—The remarkable changes which have taken place within historic times on the coast of Schleswig, north of the mouth of the Eider, are the subject of an article in *Petermanns Mitteilungen* (1893, No. 8), by Dr. R. Hansen, who traces the course of these changes from about A.D. 1200, the earliest date for which definite information is available. The chief authority for this period is the cartographer, J. Meier, who described the condition of North Friesland in the year 1240, and whose work has been dealt with by many commentators. Of earlier changes all that can be said is, that the fen-lands beneath the edge of the "Geest" of the mainland had been in process of enlargement by the formation of islands and sandbanks, and the silting up of channels, aided by the imperfect system of dykes by which the inhabitants joined island to island for the protection of their settlements. At the date mentioned the most characteristic features were :—(1) The much larger extent of the island of Nordstrand (north of the Eiderstedt Peninsula) than at the present day. This island, with others separated from it by narrow channels, covered the greater part of the area now occupied mainly by sandbanks and flats uncovered at low water, with merely the scanty remnants of the earlier land in the form of the present islands of Nordstrand and Pellworm; a narrow channel probably separated the main island from the continent, which was fringed by low land not enclosed by dykes; (2) The main channel of the Eider, joined with that of the Hever and smaller streams, then debouched north of the Eiderstedt Peninsula which it separated from the mainland; (3) This latter was at that time separated by narrow channels into four distinct islands. These as well as those before mentioned were all occupied by settlements, the oldest, especially in Eiderstedt, being placed on the sand-dunes and patches of "Geest" which occurred in parts. The subsequent changes seem to have been heralded by the formation of a channel in the 14th century, cutting off the south-east portion of Nordstrand, which soon became the main channel of the Hever, the southern one now beginning to silt up. The greatest catastrophe, however, was that ascribed with most probability to the year 1362, at which time, owing to the decimation of the population by the "black death," the dykes had been neglected, and an invasion of the sea resulted, overwhelming a large area north-west of Nordstrand, as well as the central part of the latter to the south, leaving the island in the form of a horse-shoe. The southern islands in the main escaped this catastrophe, and the process of joining them by dykes and filling up the channels proceeded, until in time they became united, while the old northern channel of the Eider was dammed up and much land near it reclaimed, so that by about 1634 the Eiderstedt Peninsula had assumed very nearly its present form. In the

year just mentioned, the second great catastrophe overwhelmed Nordstrand, again owing to the insufficiency of the dykes, due partly to their insecure foundations, and partly to the want of combination among the inhabitants. Of these over six thousand perished, many of the survivors emigrating, so that too few remained to repair the damage. The only remaining settlements were those on the present Island of Pellworm, though soon afterwards settlers from Holland and Brabant occupied the small remaining part of south-east Nordstrand which still bears that name. The subsequent changes have been unimportant, and the present dykes are of a much more substantial character, and such as, if formerly in use, would have saved the country from the catastrophes to which it was subject. The different stages are clearly illustrated by a series of maps.

ASIA.

Emigration to Siberia and Navigation on its Rivers.—According to the Russian *Official Messenger*, the emigration from European Russia to Siberia has lately been increasing as follows. The number of immigrants who have passed through the government of Tobolsk was :—

1885	..	..	..	9,680 persons	|	1889	..	..	..	30,140 persons
1886	..	..	..	11,830 „	|	1890	..	..	..	36,000 „
1887	..	..	..	13,910 „	|	1891	..	..	..	60,000 „
1888	..	..	..	26,129 „	|	1892	..	..	..	100,000 „

A certain number of emigrants take moreover the southern route, *viâ* Orenburg. As to the transport of goods by the steamers which ply between Tyumén (the terminus of the Ural railway) and the chief towns of South Siberia on the Obi and the Irtysh, the traffic did not exceed 40,000 tons in 1886. It has been steadily increasing since, and attained 97,000 tons in 1889, 145,000 tons in 1891, and 258,000 tons in 1892, the total traffic on the rivers of west Siberia being over 320,000 tons. The first steamer began to navigate in West Siberia in 1844, and it remained single till 1854. There were, however, ten steamers in 1860, twenty-two steamers in 1870 thirty-seven in 1880, sixty-five in 1890, and one hundred and two steamers, with two hundred barges and boats, in 1893. The old-fashioned steamboats are disappearing, the tendency being to have powerful tug-boats (150 to 250 horse-power) with full accommodation for passengers. The freights are, however, still high, and attain twenty to twenty-five copecks (5*d.* to 6*½d.*) for the *pud* (36 lbs.), and for a distance of from 1800 to 2000 miles—that is, they are six to seven times higher than on the Volga.

AFRICA.

Mr. G. F. Scott-Elliot's Expedition to East Central Africa.—Mr. G. F. Scott-Elliot, M.A., F.R.S., has started on an expedition to Uganda for the purpose of investigating the botany, geology, and natural history, of East Central Africa. His intention is to travel as rapidly as possible to the Victoria Nyanza (whence he hopes to pay a flying visit to Mount Elgon), and after a short rest by the lake to proceed at once to Ruwenzori Mountain. He hopes to spend several months in this mountainous district, and to obtain as complete a knowledge of the geography and natural products of this interesting region as time and funds will permit. The Royal Society have given a grant of £350 for two years

towards the expenses of this expedition, and the Royal Geographical Society have lent instruments which, it is to be hoped, will enable him to produce some useful work. The expedition will probably extend over eighteen months to two years, but the time taken will entirely depend on the expenses which will be required for the journey.

Progress of Mr. Astor Chanler's Expedition.—The following letter, dated Daicho (eastern slopes of Jombini Range), June 21st, 1893, and addressed to the Directors of the British East Africa Company, has been received from Mr. Chanler: "Since writing to you in March my expedition has been unable to proceed further than this point. The stay at Hameye proved disastrous to my beasts of burden. All camels died at or near Hameye. I lost there thirty-three donkeys, ten head of cattle, and many goats and sheep. The climate seems utterly unsuited to animals. By throwing away many loads I managed to reach this place in time to prepare for the rainy season. The rains were not heavy, and lasted but five weeks. I arrived here with seventeen donkeys only. These soon died of a disease which appeared similar to tetanus, and unfortunately gave it to some thirty of the donkeys I purchased from the natives. I now have forty donkeys, but fear that they will die before they can be of much service. Swahili caravans coming from the north report absolute starvation, so to get safely on I shall need many beasts of burden to carry food. This letter is taken to the coast by some of my men whom I have sent to buy donkeys and engage men. I fancy they will be gone three months. This time I shall employ in going to the north with Lieutenant von Höhnel and sixty-five men to try and buy donkeys and camels, and to explore the Rendile country. We expect to reach these people by following the General Matthews range to Marsabit. They are said to possess many camels, but to be unfriendly to traders. From what little information I can gather concerning them, they appear to be akin to the Somalis, but at war with them. During my absence I shall leave my servant here with sixty-five men in a strong zariba. Our stay here has been disagreeable to us, but I hope of benefit to your interests and to the interests of civilisation in general. I enclose a sketch of the Jombini Range made by Lieutenant von Höhnel.* By looking at this sketch you will see where we are now encamped, and understand more clearly what I have to tell you concerning the range and its inhabitants. When we crossed the range in February we had sharp fighting with the Wamsara, and some difficulty with the Waembe. The Daicho are dependent on the Waembe for much of their food-supply, and being much inferior to them in numbers are in some way subject to their influence. When we reached here in March the Daicho were friendly enough, but gradually became colder and finally stopped selling us food. This led to negotiations with the Waembe, which have lasted some six weeks, but have now ended in a most satisfactory manner. All donkeys come from either the Waembe, Wajanji, or Wamsara. By using the Daicho as middlemen I managed to get a few donkeys; but they died as fast as I bought them. I finally sent my servant to negotiate directly with the Waembe. He has lived for the last three weeks in their country with forty men, and succeeded in buying forty donkeys. I have tried ever since arriving here to get into close relations with these people, but they held aloof. They did not molest my servant, and soon brought donkeys and a little food; but their attitude was not friendly. Some ten days ago Lieutenant Höhnel and myself went to these people and summoned a gathering of the elders for the purpose of making a treaty. Now,

* See map, *Geographical Journal*, June 1893.

the people inhabiting the Jombini are governed by the elders or married men of their several tribes. They have no supreme head with whom we can deal. Each man who has been married three years, and owns a few goats and sheep has as much to say concerning the business under discussion as any other. Under these conditions you can imagine what our difficulties have been. After many discussions we made blood brotherhood with the Waembe. We assisted at the native function in person, and agreed with this people on behalf of all Europeans and Swahili traders to be their friends, they on their part promising never to molest Swahili traders and to always welcome Europeans. This is not much, but it is something. Heretofore the Waembe have always joined the Wajanji and Wamsara in their attacks on caravans. They have been the dread of the Swahili traders. I hope in future they will prove friendly. The most influential man on the range is a medicine man named Don y tuli mono vai Maré. He is a Diania, but his commands are listened to, to a certain extent, by all the neighbouring tribes. He sent a representative to the treaty-making, and has received a substantial present from us. He refuses to see us, however. Now that the ice is broken by the Waembe, I hope that all the tribes will come into the treaty. The natives are so stupid and ignorant that we have been enabled to treat with them only on the simplest subjects. Such a thing as making a treaty on your behalf would have been impossible for two reasons; first, they would not understand the idea, and second, there is no one with whom to make the treaty. In the course of our stay here I hope to see Don y tuli, and perhaps then something can be done. The Jombini Range is such a beautiful and salubrious bit of country that it would be a pity if it is not made use of by you. The country is to my mind much more fertile and more beautiful than the slopes of Kilimanjaro, and Lieutenant von Hünel says it possesses advantages over Kikuyu. I am sure it is healthy for Europeans, and the fertility of the soil is such that almost anything will grow here. I have sent to the coast for coconuts, mangoes, orange, and papaya seeds, and have instructed my servant to plant coffee here, and show the natives how to cultivate it. I hope the seeds will prove a success. I will write again in three months' time, telling you the work of my expedition accomplished in that period."

Middle Egypt from Ptolemaic Maps and Recent Surveys.—In a paper on the subject at the Nottingham meeting of the British Association, Mr. Cope Whitehouse said that the question whether the maps which accompany the text of Cl. Ptolemy, A.D. 150, were copied from originals extant in the eleventh century or were draughted by the copyists of the manuscripts, by plotting the positions given in the text, is of great importance. If there were original maps, contemporary with the Alexandrian geographer, or not later than the fifth century, then these copies furnish independent and trustworthy information as to those facts stated on them which are not found in Ptolemy's lists of positions. This view has been maintained by the author of this paper since 1882. The map of Middle Egypt, 1892, by the Ministry of Public Works, Cairo, and the line of levels given by Major Brown, "The Fayum and Lake Mæris" (1892), run under his direction by Messrs. Joseph and Pini, furnish a crucial test. The section of 52 miles from Beni-Suef to the furthest trace of habitation in the north-west Fayum is nowhere above the level of the Nile, except in crossing the promontory of Dimeh—the island-pyramid in Mæris of Herodotus and Diodorus. It would be an island if the water in the Fayum stood at the level of +6 metres; high Nile being taken at about +30, and the present Birket el-Kerun at -48 metres. Noting the successive changes through which this region passed, as shown by its physical conditions, history, and archæological remains, it may be established with certainty that the

positions of the places mentioned by Cl. Ptolemy could not have been plotted on a map of the middle ages, nor on a map of ancient Egypt, reconstructed from the historical and geographical data of Herodotus (B.C. 454), Diodorus (B.C. 20), or Strabo (B.C. 24). Such attempted reconstructions by Linant and others were shown; and the differences between them and Ptolemaic maps from manuscripts in Mount Athos, the Vatican, Milan, and Venice, and of Chrysanthus and Berlinghieri, and from the printed editions of Cl. Ptolemy were pointed out. The maps of Cl. Ptolemy represent his positions plotted upon a region whose relative areas of land and water only existed, as depicted, after the middle of the first century, and before the end of the third, of our era. The paper was further illustrated by views on the line from Beni-Suef to that Temple, north of Dimah, whose existence was first signalled by the author of this paper in 1882. The conclusion is that some, at least, of the maps accompanying the text of Cl. Ptolemy in mediæval manuscripts are copies, more or less faithful, of maps drawn not later than the end of the third century, and that they are probably contemporaneous with the Alexandrian geographer's text, A.D. 150.

AMERICA.

Rainfall Types in the United States.—The wide margin of uncertainty which accompanies rainfall measurements makes it necessary to receive all generalisations involving absolute amounts with a good deal of caution. Where, however, comparative distribution only is concerned and the question becomes one of ratios, it would seem that in many climates fairly reliable results may be obtained from the averages of reasonably short periods. The most recent important example of this occurs in a paper by General A. W. Greely in the *National Geographic Magazine* (Washington), vol. v., p. 45. General Greely finds that the rainfall of the United States can be divided, in respect of its distribution from month to month, into five simple types, and that these, taken along with one special composite type and others produced by combination or interference of the simple forms, account for the rainfall of the whole area. A simple type is defined as one in which the curve of average daily rainfall shows a single maximum and a single minimum for the year: a composite type as one where it exhibits double points of inflection. The chief simple types are as follows:—

1. The "Pacific" type, dominating British Columbia, Washington, Idaho, Oregon, California, Nevada, and Western Utah: characterised by very heavy precipitation in midwinter and an almost total absence of rain during the late summer.

2. The "Mexican" type dominates New Mexico, the trans-Pecos region of Texas, and probably all Mexico except the east and south: characterised by heavy precipitation after the summer solstice and a very dry period after the vernal equinox.

3 (And most important). The "Missouri" type, dominating the vast agricultural area of the watersheds of the Arkansas, Missouri, and Upper Mississippi, and of Lakes Ontario and Michigan, also Oklahoma and Northern Texas: characterised by light winter rain, and the greater part of the yearly fall in late spring and early summer.

4. The "Tennessee" type, covering Tennessee, Arkansas, Mississippi, Eastern Kentucky, Western Georgia, and part of Alabama and Louisiana. Maximum fall in end of winter or early spring, minimum in mid-autumn.

5. The "Atlantic" type, covering the entire Atlantic watershed except New England, and extending to the basin of the Upper Ohio. Maximum fall after midsummer, minimum in mid or late autumn.

To these must be added a composite form, not clearly arising from any

of them, the "St. Lawrence type"—dominating the St. Lawrence Valley, and characterised by scarcity during spring and autumn, and heavy rain at the end of summer and beginning of winter.

AUSTRALASIA AND PACIFIC ISLANDS.

Queensland Floods.—Before the Queensland Branch of the Royal Geographical Society of Australasia a paper was read in May last by the Hon. A. C. Gregory, the President of the Society, "On the Brisbane River Floods," of whose occurrence in February last some account was given in the March number (p. 239), based on the telegraphic reports then received from Brisbane. "The serious injury," Mr. Gregory says, "to property in the city which resulted from the recent floods in the Brisbane River, indicates the desirableness of instituting inquiries as to the probable recurrence of similar visitations, and whether this flood has been of such an abnormal character as not to admit of being classed with periodical occurrences." Since the first settlement of the colony, sixty-eight years ago, no flood of equal magnitude has occurred. "But during the period of the floods the rainfall," he continues, "though equal to the maximum observed on several previous occasions, was not materially greater per diem than had been recorded in previous years; and it was more in consequence of the longer duration of heavy rain over the whole of the watershed of the river that the greater rise of the flood waters is to be attributed. Taking our written history as a guide, the evidence is in favour of the conclusion that floods of the height of the last are of infrequent occurrence." An examination of the geological conditions of the area now known as the Moreton District, indicates that the Brisbane River did not in the latter part of the mesozoic period enter the sea where it now does. In the cretaceous period the sea extended to the foot of the range on which Brisbane partly stands. At the close of this period extensive volcanic action took place, during which the "disturbance of the surface level of the district was excessive. The ocean receded, and the waters of the Brisbane Valley being pent back, burst through the coast range, and cut its channel along its present course. . . . There is conclusive evidence that for a long time the relative level of the sea was about 80 feet" below what it is at present, and that it existed so for a long period. "Then a change of elevation brought the ocean level to some 20 feet or 30 feet above that which now exists. . . . Then another change of level occurred, and the ocean retired to its present position." This condition has remained for a long period. From an examination of the successive deposits of river silt over the Devonian schists on the banks of the river above the city, it is easy "to trace the height to which former floods have covered" their "rocky declivities." How many floods there were it is not possible to determine, "but the number of those inundations which rose to within 10 feet of the last flood must have exceeded fifty; and half of this number reached the same height as the flood of the present year, when the water rose a few inches above the upper limit of the river silt drift." It therefore did not materially exceed former great floods. The short grass, and the less obstructed courses of the river and its tributaries now, as compared with the surface vegetation and choked river-courses of former periods, contribute to the more rapid rise of the water near Brisbane; but this "is not likely to be more than a small factor in the total result." Mr. Gregory finally discusses whether any measures can be adopted for precaution against future floods. He finds that "we are limited to such measures as may be applicable to individual cases, such as the erection of bulk stores, beyond the influence of floods; and in those cases where storage within the limits of inundation is unavoidable, provision should be made for the quick removal of goods from the ground floors to the upper floors."

The New Hebrides.—A note on these islands is given in a recent number of *Petermanns Mittheilungen*, by Count Lanjus, who had previously contributed sketches of other parts of the Pacific visited by him. The fact that this group has been the last in that ocean to be brought under European influence is due, he says, to its unhealthiness, arising from the decomposition of the coral, and the malarious exhalations from the unusually thick layer of humus. The great fertility of the soil, however, makes the group worth developing, and its possession must sooner or later be settled between France and England. The English missionaries are regarded by the writer as political agents. The island of Annatom (Aneityum), where they have worked longest, is now Christianised, and the inhabitants carry no weapons. The Europeans number forty, principally engaged in wood-cutting; but some, too, in the collection of *copra*. The French New Hebrides Company, which owns plantations on several islands, has lately shown increased activity. Attention is paid chiefly to the cultivation of coffee. The Melanesian inhabitants compare unfavourably with the Polynesians. They are suspicious and revengeful; but the outrages committed on white men are mostly the result of the unscrupulous conduct of some of the latter. Unlike the Polynesians, they usually build their houses—wretched structures, mostly open on one side—away from the sea. The tribes are constantly at feud with one another, and each has its own dialect. Though little inclined to work for themselves, the natives are much sought after by the labour-recruiting ships. The efforts of the British authorities to restrain abuses are said to be of little effect, the employers treating the men as chattels, and Count Lanjus states that the three years' contracts are seldom renewed.

Icebergs at the Chatham Islands.—In the *Transactions* of the New Zealand Institute for 1892, vol. xxv., p. 516, Mr. Alexander Shand places it on record that on October 28th, 1892, icebergs were seen in the northern part of Hanson Bay, in latitude 44° S., drifting under the influence of the tides. On the 29th three more were seen, one off Owenga, and one outside Petre Bay. The former appeared to be between 160 feet and 200 feet in height, and 400 to 500 yards in length. On the 31st a large one was seen near the Horns (Whakahewa), estimated to be not less than 500 feet in height, as its summit towered over certain parts of the land. According to the natives, others—one over 900 feet in height—were seen drifting northward, through Pitt Strait. "The wind two or three days prior to the arrival of the bergs had been S. and S.-S.-W., very keen and strong."

Granite Rocks in the North Island of New Zealand.—In the *Transactions and Proceedings of the New Zealand Institute*, vol. xxv., p. 353, Mr. James Park, F.G.S., lecturer in the Thames School of Mines, gives an account of the discovery of granite and gneissic rocks in the King Country. Till now, the absence in the North Island of the ancient palæozoic crystalline rocks, so widely and typically developed in the provinces of Otago and Nelson in the South Island, has been the subject of many interesting discussions among geologists. "The oldest rocks hitherto known to exist in this island were certain hard splintery greywackes and slaty shales," which "have generally been placed in the carboniferous period." The exact locality of the discovery is situated on the left bank of the Mangaone Stream, about a quarter of a mile above its junction with the Tuititua River, which falls into the Waipa River 4 miles south of Alexandra. The region is occupied by long low flat-topped ridges and spurs, composed of calcareous sandstones and clays of cretaceous-tertiary age. They are distinguished by the presence of seams of brown coal at the base of the formation, "at the point where it rests on the old denuded floor of the country." In the Mangaone Valley, "the calcareous sandstones are found tilted to the north-west at a low angle, and are seen to pass

downwards into an impure limestone, which, in its turn, becomes first gritty then pebbly, and immediately passes into a coarse conglomerate, composed principally of large rounded or sub-angular boulders of granite and hard somewhat argillaceous sandstone." The granite fragments were mostly water-worn, but large angular blocks were found below the outcrop of the conglomerate, indicating the proximity of the granite *in situ*. From various facts adduced, it is inferred that this conglomerate "accumulated on a broken rocky shore, being the detritus derived by a cretaceous torrent from the erosion and destruction of a wide land area, of which no trace now remains." The former existence of a large land-surface in this region composed principally of granites and other crystalline rocks, fringed by a mantle of middle and lower secondary rocks, is conclusively established. Mr. Park has little hesitation in placing these granites and associated gneiss and quartzite rocks as Silurian. "Hitherto no granites," he says, "or ancient crystalline rocks of any kind have been known to exist in the North Island, and this may be regarded as one of the most important geological discoveries of the last thirty years." Mr. Park next attempts to discover whether the occurrence of the recent (rhyolites and trachites) and the ancient (granite and syenite) acidic rocks in the same area is a mere coincidence, and the result of the operation of natural agencies; whether the belief that the molten magma of the Earth is really composed of upper lighter, and more acidic materials and lower, denser basic materials, which has been advanced to explain the supposed ejection of the acidic lavas first and the basic lavas last, here finds support. The oldest New Zealand sedimentary rocks are Cambrian, which have not been affected by contemporaneous igneous outbursts. In the Silurian period, the lava erupted was acidic, in the Devonian basic, and in the Carboniferous again acidic. From the Permian right to the Eocene period, there was a cessation of volcanic activity in New Zealand. Towards the close of the Eocene, most violent volcanic outbursts caused many permanent modifications in the physical features of the country, and probably caused the submergence of the great continental area supposed by Hochstetter to have existed off the west coast. Another great outburst took place in Pliocene times, resulting in the formation of Ruapehu, Tongariro and other of the northern volcanoes. In recent times, evidences of volcanic action abound. It is therefore evident that "there has been no succession whatever of acidic and basic volcanic products in this area."

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Zoo-Geographical Areas of the World illustrating the Distribution of Birds.—Dr. R. Bowdler Sharpe contributes to the August number of *Natural Science* a paper on this subject, illustrated by a coloured map delineating the regions into which he has divided the world. "I have been asked," he says, "to tabulate the different regions, sub-regions, &c., of the world of which I spoke and which I illustrated in my recent course of lectures on 'Geographical Distribution of Birds,' at the Royal Institution. I do this with some hesitation, because, as I explained in these lectures, our want of zoological statistics from vast tracts of the Old World makes it almost impossible to give exact definitions of the natural areas of any of the Palæogeon divisions of the Globe. . . . This deficiency in our information, however, need not prevent us from hazarding an idea of some of the air-geographical regions of the Old World." Dr. Sharpe, in his main divisions, follows the well-known Selater-Wallace regions, viz.: A. Neartic; B. Neotropical; C. Palæarctic; D. Ethiopian; E. Indian; F. Australian Regions. The sub-regions into which Dr. Sharpe has divided these larger areas are as follows: A. NEARCTIC REGION—I. Arctic; II. Alaskan; III. Aleutian; IV. Cold temperate; V. Warm

temperate sub-Regions. This last is subdivided into (1) Humid province: *a.* Appalachian; *β.* Austroriparian; (2) Arid province: *γ.* Campestrian; *δ.* Sonoran. B. NEOTROPICAL REGION—I. *Antillean*; II. *Central American*: (1) *Mexican*; (2) *Isthmian*; III. *Patagonian*; IV. *Brazilian*; V. *Amazonian*; VI. *Sub-Andean* sub-Regions. C. PALÆARCTIC REGION, *Arctic Zone* (a circum-polar province); I. *Eurasian sub-Region*: (1) European Province; (2) Central Siberian; (3) West Siberian. II. *Mediterraneo-Asiatic sub-Region*: (1) Mediterranean Province; (2) Mediterraneo-Persic Province; (3) Mongolian Province. III. *Manchurian sub-Region*. IV. *Himalo-Caucasian sub-Region*. D. ETHIOPIAN REGION: I. *Saharan*; II. *Sudanese*; III. *West African*; IV. *Abyssinian*; V. *East African* sub-Regions; VI. *South African sub-Region*: (1) Cape Province; (2) Natalese Province; VII. *Victorian* or *Cameroonian sub-Region*; VIII. *Leunian* or *Mascarene sub-Region*. E. INDIAN REGION: I. *Indian Peninsula*; II. *Indo-Malayan*; III. *Indo-Chinese*; IV. *Himalo-Malayan*; V. *Himalo-Chinese*. F. AUSTRALIAN REGION: I. *Celebean*; II. *Moluccan*; III. *Papuan* (with North-Eastern Australia); IV. *Australian*; V. *New Zealand*; VI. *Fijian*; VII. *Hawaiian* sub-Regions.

Semi-Azimuths, a New Method of Navigation, is the title of a work by Ernest Wentworth Buller. The method of fixing the position of a ship on the chart by the inter-section of two circles of equal altitudes is well known and was used by Commander Sullivan, R.N., in 1843, previous to the publication of Captain Sumner's work which was, however, published at Boston in the same year. There is no question that during foggy weather, or when only occasional glimpses of the sun can be obtained, that Sumner's method has been of infinite service to navigators, especially when approaching the land; it however requires that two sets of observations must be taken, with a sufficient interval between them to admit of a considerable change in the sun's altitude, unless, indeed, as is frequently the case, the position of the ship can be fixed on one line of bearing by means of soundings, or when in sight of land by the recognition of some cape, lighthouse, or other landmark. Mr. Buller's method of "Semi-Azimuths" has the advantage over Sumner's in the fact that only one set of observations is necessary to get one line of bearing, and the original part of his method is the way in which he finds the other intersecting line. The manner in which he does this is very neat and ingenious, and the author is at considerable pains to explain his method by examples and diagrams. The foundation of this method is as follows:—The rhumb-line from the ship's place to the vertex of her circle of position bisects the angle between her position line and the parallel of latitude—in making with each of those lines, at their point of intersection an angle equal to half the azimuth; for further details the book itself must be consulted. Whether this method of fixing a ship's position will at once come into general use at sea is open to doubt. Seafaring men as a body are not quick to take up with anything new in the way of navigation. In a vast majority of cases the rule of thumb still obtains, and at first sight this method appears to be more complicated than it really is. The fact, however, remains that Mr. Buller's method is an accurate one, and has decided advantages over Sumner's in that it only requires one set of observations, which is frequently all that can be obtained, and there is every reason to believe that, in the course of time, the more intelligent class of seamen will recognise its merits. The present volume is only Part I. of the book, and it is the intention of the author to publish Part II., which will be devoted to the mathematical investigation of his method.

The Influence of Forests on Climate.—In the *Meteorologische Zeitschrift* for June Dr. Ebermayer, who has identified himself with the subject since 1866, reviews the present knowledge of the influence of forests on the climate of the region

covered by them and in their neighbourhood, and in particular the Austrian observations made during the three years 1885-87 form a basis for discussion. The chief difficulty in these inquiries, that of eliminating other local influences, has been got over by surrounding a central observatory in the heart of the forest with radial lines of stations extending in different directions to the open country beyond. For the most part, however, these radial lines are limited to two, running east and west. The method, although inferior to that employed by Blanford in the Central Provinces of India, where the transition of open country to forest land was actually followed from the time of planting trees, is undoubtedly sound. It appears that in cleared spaces surrounded by forest the trees act chiefly in checking air movement, and thereby promoting radiation. Within the forest itself the increased calmness fails to increase radiation effects on account of the protecting shade. Where the surrounding country is concerned the forest must be treated simply as a somewhat elevated surface of vegetation. Upon this surface rests a layer of air which will in general have a different temperature from the air at the same level over open land; and since the tree-tops offer less frictional resistance than the ground a body of warmer or colder air is easily moved away and spreads over the neighbourhood as a kind of miniature *föhn*. This effect may be recognised for a distance of 2 to 4 miles. From sixteen years' observations in the Nürnberger Reichswald, Dr. Ebermayer obtains a result agreeing with that of Blanford—12 per cent. more rainfall over forest country than over open. He does not, however, consider that the evidence amounts to anything like general proof. As a climatic factor forests may be ranked as of secondary importance—far below mountains, and below lakes and inland seas.

Magnetism and Meteorology.—Amongst a number of investigations initiated by Professor M. W. Harrington shortly after his appointment as chief of the United States Weather Bureau, was one dealing with the phenomena of terrestrial magnetism. This work was entrusted to Professor Frank H. Bigelow, and some important results regarding methods of discussion were published some time ago (*Bulletin* No. 2, 1892). Professor Bigelow gives an abstract of further developments of his work in the *American Meteorological Journal* (September, 1893, p. 206), in which he claims to have discovered a periodicity in meteorological elements coinciding with variations in the magnetic field due to the sun. Starting with the facts that the poles of magnetisation of the sun's nucleus, which he calls coronal poles, are located about $44\frac{1}{2}^\circ$ from the axis of rotation, and that the south precedes the north coronal pole by about 102° of longitude, Professor Bigelow deduces, from the magnetic observations at a number of stations in the northern hemisphere, the form of the periodic curve which represents the variations in intensity of the coronal magnetic field. The "Mean Magnetic Coronal Curve" exhibits a synodic period of 26·68 days, and its inflections show remarkable resemblances to a number of weather and storm curves for America, Europe, and the Atlantic. Professor Bigelow promises further details in the near future; but for the present urges the adoption of the 26·68 day period for taking residuals in meteorological inquiries in place of the calendar month, for the reason that the calendar month has no reference to the periodic recurrences of these phenomena, and consequently the residuals cut themselves up in applying to a long series of observations.

The Waters of the Atlantic and the Mediterranean.—Mr. J. Y. Buchanan publishes in the *Comptes Rendus* (tome cxvi. No. 23) a note on the relation of density to alkalinity in the waters of the Atlantic and the Mediterranean, as shown by the examination of thirty-nine samples collected by him on board the *Prince of*

Monaco's yacht *Princesse Alice*. The densities were determined by a hydrometer of the *Challenger* type, and the alkalinities by the usual method of titration. Subtracting the weight of 1 litre of distilled water at a temperature of 23° C. from the weight of 1 litre of sea-water at the same temperature, and dividing the result by the alkalinity, Mr. Buchanan obtains a series of fractions representing the ratio of salinity to alkalinity. The mean value for the Atlantic he finds to be 0.5000, and for the Mediterranean 0.4875. He attributes the smallness of the difference to the abundance of calcareous rocks on the shores of the latter sea.

The Mean Density of the Earth.—In the November (1892) number of the *Sitzungsberichte* of the Vienna Academy of Sciences, Professor Temlirz, of Czernowitz University, gives a new method of calculating the Earth's mean density from its form and the intensity of gravity observed at the equator and the pole. Assuming that the mean density of an ellipsoidal shell of the earth can be expressed by a series as a function of its major and minor axes, Professor Temlirz substitutes its value in differential equations of the earth's "potential," first in the plane of the equator, and second in the polar axis. The latter equation represents the polar value of gravity and the former the equatorial value *plus* the effect of centrifugal force. It thus becomes possible to determine the constants for the first two terms of the density series, and employing Bessel's figures for the dimensions of the Earth, and Pouillet's for the value of gravity, it is found that compared with the surface shell the mean density of the whole Earth is 2.3383, and the density at the centre 4.3458. Taking the mean density at the surface as 2.5 times that of water we get for the whole globe 5.846, somewhat higher than the value given by Jolly, and for the centre 10.864. Listing's values of gravity give a mean density 6.672, again a little greater than the value determined by Airy. The method is of peculiar interest when applied to the determination of the value of g at different depths below the surface. It shows that at the equator g reaches a maximum value of 10.302 at a depth of some 600 miles, and that near the surface it increases by 1.1106×10^{-6} for each mètre of descent. Airy, at the Harton Colliery, observed an increase of 1.3335×10^{-6} , and Major von Sterneck, at Pribram, of 0.88074×10^{-6} , the mean of which, 1.1021×10^{-6} , agrees well with Professor Temlirz' result.

The Temperature and Density of Sea Water between the Atlantic Ocean and North Sea.—At the Nottingham meeting of the British Association, Mr. H. N. Dickson read a paper on this subject. At the instance of the Fishery Board for Scotland the author spent the greater part of August, 1893, on H.M.S. *Jackal* in investigating the distribution of temperature and salinity on the northern and western borders of the continental shelf. Starting from a point 54 miles due north of the Shetlands, a line of soundings was run eastwards for about 70 miles in depths of 100 to 200 fathoms, and this was backed by a return line further south in shallower water. A line was next run from the north of the Shetlands to Suderö, Færo Islands, temperatures being observed at depths up to 416 fathoms in the Færo Shetland Channel. From Færo a line of soundings was made to latitude 59° 45' N., longitude 5° W., whence a due easterly course was made to longitude 1° E. The latter part of the cruise was occupied with a further study of the conditions existing to the east of the Orkneys and Scotland as far south as Aberdeen. The observations, so far as they have been discussed, extend the results obtained by Dr. H. R. Mill to the west of Lewis in 1888; a warm layer, temperature 53° to 56° F., varying in thickness from 15 to 25 fathoms, lies upon the main body of water, the surface of which is some 3° to 4° colder, while its temperature decreases with the depth. At 400 fathoms in the Færo Channel the temperature recorded was

30°·9 F., and the salinity of the water was slightly less than nearer the surface. Cold water of relatively low salinity was found on the north-east margin of the North Sea plateau, and again about 50 miles south-east of Sumburgh Head in Shetland.

CORRESPONDENCE.

Depth of the English Lakes.

In reference to the greatest depth of Lake Derwentwater, 72 fathoms, referred to in the "Monthly Record" for July, may I point out that it was ascertained by my lamented colleague, Clifton Ward, in 1872, when he was stationed at Keswick, and with the consent of our late Director-General, Sir Andrew Ramsay, F.R.S., made a bathymetrical survey of the English lakes, and many tarns, in association with Messrs. Aveline, F.G.S., Cameron, F.G.S., Hebert, F.G.S., and myself. The positions were fixed with the prismatic compass, and the observations were recorded on the 6-inch maps. A useful reduction of the work done appears in the plates accompanying Mr. Ward's papers on the "Glaciation of the Lake District," published in vols. xxx. and xxxi. of the *Quar. Jour. Geol. Soc.* 1875. The untiring energy and total disregard to the effects of a wet climate probably led to the Rev. Clifton Ward's premature death, when soon after he left the Geological Survey, he took orders, and became Vicar of Rydal.

The lakes examined by Mr. Aveline, who was in charge of the district, and his staff are as follows:—By the Rev. Clifton Ward, Derwentwater, Bassenthwaite, Wastwater, Grasmere, Rydal and Easdale tarns; by Messrs. Aveline and Cameron, Coniston; by Mr. Hebert, Burnmoor, Blea, and Little Langdale tarns, and Elter Water; by myself Windermere, above Belle Isle, and Loughrigg tarn. Mr. Ward also checked and added to the older observations of Mr. P. C. Crosthwaite, as regards Buttermere, Crummock, and Lowes Water, and fixed the positions on the 6-inch maps.

CHAS. E. DE RANCE, F.G.S., F.R.G.S.,
H.M. Geological Survey.

[The early maps of the English lakes executed from surveys by P. C. Crosthwaite about one hundred years ago were so inaccurate in topography as to make them of little value at the present day, and we could only use them as a rough guide in getting a preliminary idea of the arrangement of depths. I am familiar with the admirable work of the late Mr. Clifton Ward and his colleagues, and when discussing the results of our survey I shall refer to it at some length. The observations then made, however, required extension from the geographical point of view. Briefly speaking, Mr. Ward's work sufficed for determining the general form of the cross-sections of the lakes, but was not sufficient to enable the horizontal contours to be laid down. I was not aware before reading Mr. de Rance's letter that these results had been recorded on the 6-inch (geological) maps, probably because I have only seen the 1-inch geological survey of the lakes, and the figures do not appear there nor on the 6-inch Ordnance maps. The results of the work by Mr. Heawood and myself would be used to supplement the earlier survey if we could be sure of the exact level of the lakes on the previous occasion. Probably Mr. de Rance can give us this information.—HUGH ROBERT MILL.]

OBITUARY.

George H. Garrett.—We regret to announce the death of Mr. G. H. Garrett who quite recently contributed an interesting paper on Sierra Leone to one of our evening meetings. He was born in the year 1842. He lost his parents while young, and a friend of the family (a Liverpool shipowner) appointed him midshipman on board one of his ships going to China. The vessel was taken over by the Government for use during the China war of 1856-8, and Mr. Garrett was on the battlefield a few hours after the Taku Forts were taken. After visiting Singapore, Bombay, the Cape, and other places, he returned to England and spent about nine years in a London banking-house. Seeing a chance of doing business on the West Coast of Africa he left England again for Sierra Leone. The Government offered him the appointment of sub-treasurer and collector of British Sherbro in January 1887. He was made Justice of the Peace for Sierra Leone, Commissioner in the Court of Requests, and Deputy-Coroner at Sherbro, February 1887. Mr. Garrett was made Acting Civil Commandant at British Sherbro in 1888, and Travelling Commissioner for Sierra Leone in 1889. He acted as Hon. Inspector of the Sierra Leone Frontier Force on a mission to Wendehe to break up the stronghold of freebooters. The force rescued three thousand captives and brought them safely to Bandajumah, March 22nd, 1889. Mr. Garrett crossed the head waters of the Niger to Trong, in Wassulu, on a mission to Almami Samodu, March to July, 1890. He went on a mission to Sanda Country and dispersed rebels stockaded at Laminaya, February 1891. Mr. Garrett was made District Commissioner and Coroner of British Sherbro District, December 1891 to August 1893. He died at the Royal Southern Hospital, Liverpool, August 10th, 1893. Mr. Garrett was awarded the Gill Memorial by the Council of the Society in 1892.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. R. = Comptes Rendus.	S. = Society, Société, Selskab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mittheilungen.	Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is $10 \times 6\frac{1}{2}$.

EUROPE.

Austria—Limestone District.

Das Karstphänomen. Versuch einer geologischen Monographie. Von Dr. Jovan Cvijić, Professor der Geologie an der Universität zu Belgrad. Wien, Ed. Hölzel, 1893: size $10 \times 6\frac{1}{2}$.

Part 3 of vol. v. of Penck's *Geographische Abhandlungen*.

Cvijić.

Europe.**Hertslet.**

The Map of Europe by Treaty, showing the various Political and Territorial Changes which have taken place since the general Peace of 1814. With numerous maps and notes. Vol. iv., 1875 to 1891. By Sir Edward Hertslet, C.B. London, Harrison & Sons, 1891: size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. xxvi. and 2401-3380.

France.**Gourdault.**

J. Gourdault. *La France Pittoresque. Ouvrage illustré de 370 gravures.* Paris, Hachette et Cie., 1893: size $12\frac{1}{2} \times 8\frac{1}{2}$, pp. 478. *Price* 6s.

The low price of this remarkably fine work should secure for it an enormous circulation. To turn over its pages is sufficient to impress the variety and beauty of French scenery from the North Sea to the Pyrenees and from the Bay of Biscay to the Vosges in a manner second only to seeing the scenes themselves.

France—Provence.**Robida.**

La Vieille France. Texte, Dessins et Lithographes, par A. Robida. Paris, La Librairie Illustrée. Not dated (1893): size $12\frac{1}{2} \times 9\frac{1}{2}$, pp. 332. *Price* 20s.

Full of artistic and characteristic drawings of the quaint old towns of southern France.

France—The Causses**Miriam.**

Itinéraires Miriam—Les Causses et les Cañons du Tarn, avec plus de 100 dessins inédits, dont 20 grands hors texte . . . Edité à mende en 1892 par la section de la Lozère et des Causses du C. A. F. (No publisher's name). Size $7\frac{1}{2} \times 5\frac{1}{2}$, pp. 232, cxx., etc. *Price* 5 fr.

Under the authority of the French Alpine Club this guide to the region of the Causses and its underground wonders will be received with confidence, and should prove very serviceable to tourists.

Germany—Rügen.**Credner.**

Rügen. Eine Inselstudie. Von Dr. Rudolf Credner, Professor der Erdkunde an der Universität Greifswald. Stuttgart, Engelhorn, 1893: size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 124. *Price* 9 marks.

Part 5 of vol. vii. of Kirchhoff's series of *Forschungen zur deutschen Landes- und Folkes-kunde*.

Germany—Schleswig. *Petermanns M.* 39 (1893): 177-181.**Hansen.**

Küstenänderungen im südwestlichen Schleswig. Von Dr. R. Hansen in Oldesloe. *With three maps.*

Southern Europe.**Fischer.**

Ländeskunde der drei sudeuropäischen Halbinseln. Von Dr. Theobald Fischer, Professor der Geographie an der Universität, Marburg. (Maps and illustrations). Zweite Hälfte, Leipzig, G. Freytag, 1893: size $11\frac{1}{2} \times 7\frac{1}{2}$, pp. 784 *Presented by the Author.*

This work will be specially reviewed.

Switzerland.**Baedeker.**

Switzerland and the adjacent portions of Italy, Savoy, and the Tyrol. Handbook for travellers. By K. Baedeker. With 39 maps, 12 plans, and 12 panoramas. Fifteenth edition. Leipsic, Karl Baedeker. London, Dulau & Co., 1893: size $6\frac{1}{4} \times 4\frac{1}{2}$, pp. xxviii. and 496. *Price* 8 marks. *Presented by the Publishers.*

It is unnecessary to do more than record the appearance of a new edition of this long-known and much-trusted guide.

Switzerland.**Murray.**

A Handbook for Travellers in Switzerland. Part I.—Switzerland without the Pennine Alps. Part II.—The Alps of Savoy and Piedmont, the Italian Lakes and part of the Dauphiné. Eighteenth edition. London, John Murray, 1892: size 7×5 , pp. viii. and 703, *maps and plans.* *Price* 10s. *Presented by Mr. Murray.*

Contains additional information for 1893, and a number of new (contour) maps

by Bartholomew, engraved on a large scale, a special feature of the present edition. These maps show the configuration of Switzerland with a clearness and precision never before attempted in any guide-book to that country known to us.

ASIA.

Indo-China.

Bouinai and Paulus.

L'Indo-Chine Française Contemporaine. Cochinchine, 2^e Édition revue et augmentée. Cambodge, Tonkin, Annam. Par A. Bouinai et A. Paulus. 2 vols. Paris, Challamel Aîné, 1885: size 10 × 6½. pp. (vol. i.) xiii. and 582; (vol. ii.) 838, *maps and illustrations.*

India—Chitral, &c.

Petermanns M. 39 (1893): 181-186.

Immanuel.

Tschitral, Jassin und Kunjut. Von F. Immanuel. *With map.*

India—Irawadi.

Min. P. I. Civil Engineers 113 (1893): 276-313.

Gordon.

Hydraulic work on the Irawadi delta. By R. Gordon. 2 *plates*, 4 *illustrations and appendices.*

The geographical interest of this paper lies in the adaptation of engineering works to give artificial stability to the topography of a great river delta where incessant changes in physical geography are in progress.

India—Kashmir.

Thackeray.

From Assam to Kashmir. Notes on Sport and Travel, by Colonel E. T. Thackeray, R.E., C.B., F.R.G.S. Privately printed. Not dated. (1893?): size 9 × 6, pp. 42. *With photographic illustrations. Presented by the Author.*

A collection of interesting narratives of sporting journeys in Northern India.

Sakhalin.

Howard.

Life with Trans-Siberian Savages. By B. Douglas Howard, M.A. London, Longmans & Co., 1893: size 8 × 5½, pp. x. and 209. *Price 6s. Presented by the Publishers.*

An account of life among the Ainus of the Island of Sakhalin, with whom the author states that he lived on terms of close friendship for a considerable time.

Turkey—Bagdad.

Cuinet.

La Turquie d'Asie, Géographie Administrative, Statistique, Descriptive et Raisonnée de chaque province de l'Asie-mineure. Par Vital Cuinet. Tome troisième. Paris, Ernest Leroux, 1893: size 11 × 7½, pp. 1-240.

The seventh fascicle of this important treatise describes the vilayet of Bagdad.

AFRICA.

African Hygiene.

Parke.

Guide to Health in Africa, with notes on the country and its inhabitants. By Thomas Heazle Parke, Surgeon-Major, A.M.S., etc. With preface by H. M. Stanley. London, Sampson Low, Marston & Company, 1893: size 7 × 5, pp. 176. *Price 5s.*

Melancholy interest attaches to this work by the late Dr. Parke, which was published only a few months before his death. It contains concise and practical directions for the treatment of the common African diseases, which must prove of the utmost service to travellers. The preliminary remarks on the climate, the natives, the fauna, and flora, of Africa, are necessarily very brief and general.

Egypt—Lake Moeris.

Petermanns M. 39 (1893): 191-196.

Schweinfurth.

Der Moeris See nach den neuesten Forschungen. Von G. Schweinfurth.

An elaborate review of Major Brown's book on the Fayum and Lake Moeris.

Katanga.

Moloney.

With Captain Stairs to Katanga. By Joseph A. Moloney, L.R.C.P., F.R.G.S. London, Sampson Low & Co., 1893: size 8 × 5, pp. xii. and 280, *map and illustrations.* *Price 8s. 6d.*

Dr. Moloney, who accompanied the expedition to Katangaland as medical officer,

here narrates the incidents of the journey, and gives some useful notes on the country and people met with along the line of route. A summary of his journey was published in the *Journal* for September, p. 238.

Somaliland.**Paulitschke.**

Ethnographie Nordost-Afrikas. Die materielle Cultur der Danakil, Galla und Somal. Von Dr. Philipp Paulitschke. Berlin, Dietrich Reimer, 1893. Size $11\frac{1}{2} \times 8$, pp. xvi. and 338. *Map and plates.* Price 20s.

A profound study of the peoples inhabiting Somali-land and the surrounding regions, with reference to their ethnography, customs, and general mode of life. A large map, and a series of excellent photographs accompany the work.

West Africa.**Dybowski.**

Jean Dybowski. *La Route du Tehad, du Loango au Chari.* Ouvrage illustré de 136 dessins inédits. Paris, Firmin-Didot et Cie., 1893: size 11×7 , pp. 382. Price 8s. 6d.

M. Dybowski describes his journey from the Mobangi to the Shari with many important observations on the people, natural history and commercial resources of the regions through which he passed. There is a clear route-map, and the numerous illustrations are admirable.

NORTH AMERICA.**Canada—Northern Lakes.** *B. S. Neuchateloise G. 7* (1892-93): 366-378. **Petitot.**

Exploration d'une série de grands lacs sis au nord du Fort Good Hope, en 1878. Par Emile Petitot, ancien missionnaire et explorateur arctique.

Mexico—Chinipas. *Min. P. I. Civil Engineers 113* (1893): 261-275. **Holtham.**

The Chinipas Aqueduct and Mineral Railway, North-West Mexico. By E. G. Holtham. *Plate, 5 illustrations and appendix.*

United States—California.**Holden.**

Earthquakes in California in 1890 and 1891. By Edward Singleton Holden. *Bulletin of the United States Geological Survey*, No. 95. Washington, Government Printing Office, 1892: size $10 \times 6\frac{1}{2}$, pp. 29. *Presented by the United States Geological Survey.*

United States—Minerals.**Day.**

Department of the Interior, United States Geological Survey, J. W. Powell, Director. *Mineral Resources of the United States.* Calendar year, 1891. David T. Day, Chief of Division of Mining Statistics and Technology. Washington, Government Printing Office, 1893: size $9\frac{1}{2} \times 6$, pp. iv. and 630. *Presented by the United States Geological Survey.*

United States—Nevada.**Hague.**

Department of the Interior, United States Geological Survey, J. W. Powell, Director. *Monographs of the United States Geological Survey.* Vol. xx. *Geology of the Eureka District, Nevada, with an Atlas.* By Arnold Hague. Washington, Government Printing Office, 1892: size $11\frac{1}{2} \times 9\frac{1}{2}$, pp. xvii. and 419, *map and plates.* *Presented by the United States Geological Survey.*

CENTRAL AND SOUTH AMERICA.**Colombia—Goajir.****Candelier.**

Rio-Hacha et les Indiens Goajires. Par H. Candelier. Paris. Firmin-Didot et Cie., 1893: size $8 \times 5\frac{1}{2}$, pp. xvi. and 282. Price 3s.

A slight record of travel in a region of which the literature is very scanty.

French Guiana.**Coudreau.**

Henri Coudreau. *Chez nos Indiens. Quatre années dans la Guyane Française (1887-1891).* Ouvrage contenant 98 gravures et 1 carte. Paris. Hachette et Cie., 1893: size $12 \times 8\frac{1}{2}$, pp. iii. and 614. Price 15s.

The explorations of M. Coudreau in French Guiana have been frequently brought

before our readers, and we welcome this embodiment of his researches enriched with all the adornments which Messrs. Hachette know so well how to supply. The illustrations are chosen with exceptional care and reproduced in a most realistic manner. The map embodies much new work. Most interest centres in the description of the tribes of the far interior in the Tumak-humak mountains.

Nicaragua.**Pector.**

Etude économique sur la République de Nicaragua (Amérique Centrale).
Par Désiré Pector, consul de Nicaragua à Paris (avec 5 cartes et 4 tableaux
hors texte). Neuchatel, 1893: size $9\frac{1}{2} \times 6$, pp. 186. *Presented by the Author.*

A separate copy of an elaborate paper in the *Bulletin* of the Neuchâtel Geographical Society. It includes, as well as a general account of the commercial geography of Nicaragua, a complete alphabetical gazetteer of the country, and a number of statistics as to trade relations.

AUSTRALASIA AND PACIFIC ISLANDS.**Niue.***J. Polynesian S.* 2 (1893): 11-24.**Tregear and Williams.**

Description and Vocabulary of Niue, or Savage Island. By Edward
Tregear and [the vocabulary] Harold Williams.

GENERAL.**Anthropology—Index.****Bloxam.**

Index to the publications of the Anthropological Institute of Great Britain and Ireland (1843-1891). Including the *Journal and Transactions of the Ethnological Society of London* (1843-1871); the *Journal and Memoirs of the Anthropological Society of London* (1863-1871), and the *Anthropological Review*. By George W. Bloxam, M.A. London, 1893: size 9×6 , pp. 8 and 302. *Price 10s. Presented by the Anthropological Institute.*

This index represents a vast amount of labour put to a most important purpose. It is a complete record of the science of Anthropology, and a work of reference which will prove of the utmost service to all geographical workers whose studies include with the Earth itself the people who inhabit it. Mr. Bloxam and the Anthropological Institute deserve great credit for their work.

Biography—Burton.**Burton.**

The Life of Captain Sir Richard F. Burton, K.C.M.G., F.R.G.S. By his wife, Isabel Burton. With numerous portraits, illustrations, and maps. In two volumes. London, Chapman and Hall, 1893: size 9×6 , pp. vol. i., xxvi. and 606, vol. ii., x. and 664. *Presented by the Author.*

Sir Richard Burton's geographical achievements were so fully described in the obituary notice published in the *Proceedings*, that it is unnecessary now to recapitulate the many journeys and manifold writings of this most fearless traveller and profound student. Lady Burton pictures the whole man seen from a standpoint inaccessible to any other, and she succeeds in a manner peculiarly her own in placing the peculiarities of his composite character before the reader. It would be out of place in this *Journal* to criticise the biography in any way, and impossible to summarise the plan on which it is constructed. We can only stamp it as a singularly appropriate memorial of the great and original life it portrays.

Bibliography Spanish MSS.**Gayangos.**

Catalogue of the Manuscripts in the Spanish Language in the British Museum. By Don Pascual de Gayangos. Vol. IV. London, 1893: size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. vii. and 345. *Price 12s.*

The MSS. catalogued include a large number of valuable geographical works.

Ptolemy's Geography.**Rylands.**

The Geography of Ptolemy Elucidated. By Thomas Glazebrook Rylands, F.R.S., etc. Printed for the author by Ponsonby and Woldrick at the University Press, Dublin, 1893: size $12\frac{1}{2} \times 10$, pp. xx. and 98. *Maps and Illustrations. Presented by the Author.*

A most painstaking study of Ptolemy, which will be specially reviewed.

Richthofen Testimonial.

Festschrift Ferdinand Freiherrn von Richthofen zum sechzigsten Geburtstag am 5 Mai, 1893. Dargebracht von seinen Schülern. Berlin, 1893. Dietrich Reimer. *Presented by Messrs. Williams and Norgate.*

This beautifully-got-up volume was prepared as an album for presentation to Baron Richthofen on his sixtieth birthday. It includes contributions from a number of his old students, the principal papers being—On “Some Types of Coast Formation,” by Dr. Alfred Philippson; on “A Typical Fjord Valley,” by Dr. Erich von Drygalski; on “The Lake of Constance,” by Dr. Robert Sieger; on “The Tribulaun Group of the Brenner,” by Dr. Fritz Frech; on “The Geotectonic Relations of Syria and the Red Sea,” by Dr. Max Blanckenhorn; on “The Discoverer of the Cape de Verde Islands,” by Mr. H. Yule Oldham; on “The Rainfall and Plant Distribution of the Tropical Andes,” by Dr. Alfred Hettner; on “The Dimensions of Ocean Waves,” by Dr. Gerhard Schott; on “The Cosmography of Petrus Candidus Decembrius,” by Dr. Konrad Kretschmer; on “The Topography and Geology of the Andes of Llanquihue,” “On the Mathematical Treatment of Geographical Problems,” by Dr. Carl E. M. Rohrbach; a map of Eastern Asia on the scale 1 : 10,000,000, by Dr. Hans Fischer; on “The Economic Standing of the Negro Race,” by Dr. Eduard Hahn; and on “The Unveiling of Unknown Tibet,” by Dr. Georg Wegener. We can imagine no more grateful compliment to a distinguished teacher than such tangible proof that his labours are developing knowledge in all parts of the globe.

Scriptural Archæology.

Helps to the Study of the Bible, including Introductions to the several Books, the History and Antiquities of the Jews, the results of modern discoveries and the Natural History of Palestine, with copious tables, concordance, and indices, and a series of maps. Oxford, University Press; London, Henry Frowde: size $7\frac{1}{2} \times 5$, pp. 636. *Presented by the Publisher.*

The geographical and geological sections of this well-executed compilation are brought up to date.

Swift's Works.**Craik.**

Swift: selections from his works. Edited, with Life, Introductions, and Notes, by Henry Craik. 2 vols. Oxford, Clarendon Press, 1892-93: size $8 \times 5\frac{1}{2}$, pp., vol. i., viii. and 476; vol. ii., 488. *Presented by the Publishers.*

The notes include an interesting discussion of the geography of Gulliver's travels, showing how ingeniously Swift utilised the knowledge of the time.

The following works also have been recently added to the Library:—

Biography—Marsden.

Memoirs of the Life and Labours of the Rev. Samuel Marsden, of Parramatta, Senior Chaplain of New South Wales, and of his early connection with the Missions to New Zealand and Tahiti. Edited by the Rev. J. B. Marsden, M.A. London, The Religious Tract Society; size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. viii. and 326, *portrait and illustrations.*

Canada.**Lorne.**

Canadian Life and Scenery, with Hints to intending Emigrants and Settlers. By the Marquis of Lorne, K.T. [London], The Religious Tract Society, 1886: size 6×4 , pp. 191, *illustrations.*

China.**Le Compte.**

Memoirs and Observations . . . made in a late Journey through the Empire of China, and published in several Letters. . . . By Louis Le Compte, Jesuit. Translated from the Paris edition, and illustrated with Figures. London, 1697: size 8×5 , pp. 527.

Chinese Collection.**Langdon.**

A Descriptive Catalogue of the Chinese Collection, now exhibiting at St. George's Place, Hyde Park Corner, London, with condensed accounts of the genius, government, history, literature, agriculture, arts, trade, manners, customs and social life of the people of the Celestial Empire. By Wm. B. Langdon. London, 1842: size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 150, *illustrations.*

Dominican Republic.**Abad.**

La Republica Dominicana, Reseña General Geografico-Estadística redactada. Por José Ramón Abad. Santo Domingo, 1888: size 10 × 7, pp. 400.

India—Thugs.

Ramaseedna, or a Vocabulary of the peculiar language used by the Thugs, with an Introduction and Appendix, descriptive of the system pursued by that fraternity and of the measures which have been adopted by the Supreme Government of India for its suppression. Calcutta, G. H. Huttman, 1836: size 9 × 6, pp. v., 270, and 515; *plates*.

Mauritania—Arabic Grammar.

Grammatica linguae Mauro-Arabicae juxta vernaculi idiomatis usum. Accessit Vocabularium Latino-Mauro-Arabicum. Opera et studio Francisci de Dombay caes. Reg. linguarum orientalium interpretis. Vindobonae apud Camesina, 1800: size $8\frac{1}{2} \times 7\frac{1}{2}$, pp. 136. *Plate*.

Physical Geography.**Cuvier.**

Essay on the Theory of the Earth. Translated from the French of M. Cuvier, by Robert Kerr, F.R.S., &c. With Mineralogical Notes, and an account of Cuvier's Geological Discoveries, by Professor Jameson. Edinburgh, W. Blackwood & Co., 1813: size 9 × $5\frac{1}{2}$, pp. xiii. and 265; *plate*.

Puerto Rico.**Abad.**

Puerto-Rico en la Feria—Exposicion de Ponce en 1882. Memoria redactada de orden de la pinta directiva de la misma, por Don José Ramón Abad. Ponce, P.R., 1885: size $9\frac{1}{2} \times 6$, pp. 351.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.**Scotland.****Bartholomew.**

Bartholomew's Reduced Ordnance Survey of Scotland. Scale 1:126,720, or 2 stat. miles to an inch. Sheet No. 24, Gair Loch and Loch Inver. J. Bartholomew & Co., Edinburgh, 1893. *Price 2s. mounted on cloth. Presented by the Publishers.*

This is one of Bartholomew's reduced Ordnance Survey Series of Scotland. The elevations are shown by a combination of contour lines and orographic colouring, the main roads are brown and the water blue. The present map, like all others of this series, is drawn in a remarkably clear style, and is well suited to the purpose for which it is published.

Scotland.**Harvie-Brown and Bartholomew.**

Naturalist's Map of Scotland. By J. A. Harvie-Brown, F.R.S.E., F.Z.S., and J. G. Bartholomew, F.R.G.S., F.R.S.E. Scale 1:633,600, or 10 stat. miles to an inch. John Bartholomew & Co., The Edinburgh Geographical Institute, 1893. *Price 2s. 6d. paper, 3s. 6d. mounted on cloth. Presented by the Publishers.*

A large amount of labour has evidently been expended in the compilation of this map, which is intended for the use of naturalists. It is accompanied by explanatory letterpress, and notes on the system of colouring employed.

AFRICA.**Manika Country.****Wybergh, Bayne, and Fairbridge.**

Plan of the Manika Gold Belt. From Surveys made in 1892 by Messrs. W. Wybergh, T. Bayne, and R. S. Fairbridge. Scale 1:126,720, or 2 stat.

miles to an inch. Map of the East Coast Route to Mashonaland, Beira to Salisbury, showing the railway now being constructed. R. S. Fairbridge, Government Land Surveyor, Fort Salisbury. December 1892. Scale 1:633,360, or 10 stat. miles to an inch. Juta & Co., Cape Town. *Presented by the British South Africa Company.*

This sheet contains two entirely distinct maps, one exhibiting the Manika Gold Belt on which the several mining claims are marked, the other is a sketch-map of the proposed railway from Beira to Salisbury. The altitudes given on the map have been taken with the aneroid.

AUSTRALASIA.

New Zealand.

Lands and Survey Office, Wellington.

Auckland. Sheet No. 5. Scale 1:250,000, or 4 statute miles to an inch. —Taranaki. Scale 1:252,500, or 4 statute miles to an inch. Department of Lands and Survey, Wellington, N.Z. Percy S. Smith, Surveyor-General, 1892. *Presented by Surveyor-General of New Zealand.*

GENERAL.

Ancient Atlas.

Spruner-Sieglin.

V. Spruner-Sieglin, Hand-Atlas zur Geschichte des Altertums, des Mittelalters und der Neuzeit. I. Abteilung: Atlas Antiquus, Atlas zur Geschichte des Altertums. 34 kolorierte Karten in Kupferstich enthaltend 19 Übersichtsblätter, 94 historische Karten und 73 Nebenkarten. Entworfen und bearbeitet von Dr. Wilhelm Sieglin. Erste Lieferung. Gotha, Justus Perthes, 1893. *Price 2 marks 50 pf. each part.*

This is an entirely new edition of Spruner's Historical Atlas, of which the first section is devoted to ancient geography. It will consist of eight parts; six containing four maps, and two parts containing five maps. Each issue will appear at intervals of from six to eight weeks, and after the publication of the last part an index will be supplied, for a moderate charge, to those who may wish to have it. The present issue contains the following maps:—No. 3, Aegyptus; No. 5, Palestina inde a Davide rege usque ad imperatorem Hadrianum; No. 8, Imperium Persarum Darii Hystaspis tempore; No. 25, Italia inde a bello Punico secundo; No. 30, Britannia et Hibernia. The maps are very well drawn, the colours carefully chosen, and there are numerous insets.

The World.

Johnston.

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Part 23. W. & A. K. Johnston, Edinburgh and London. *Price 4s. 6d. each part, Presented by the Publishers.*

This part contains maps of Asia and the northern part of South America.

PHOTOGRAPHS.

France.

Jackson.

Eighty-two Photographs of Southern France, taken by Monsieur James Jackson, January to April, 1893. *Presented by Monsieur James Jackson.*

This is a very interesting series of photographs, many of which are well chosen to exhibit the topographical and geological features of the country.

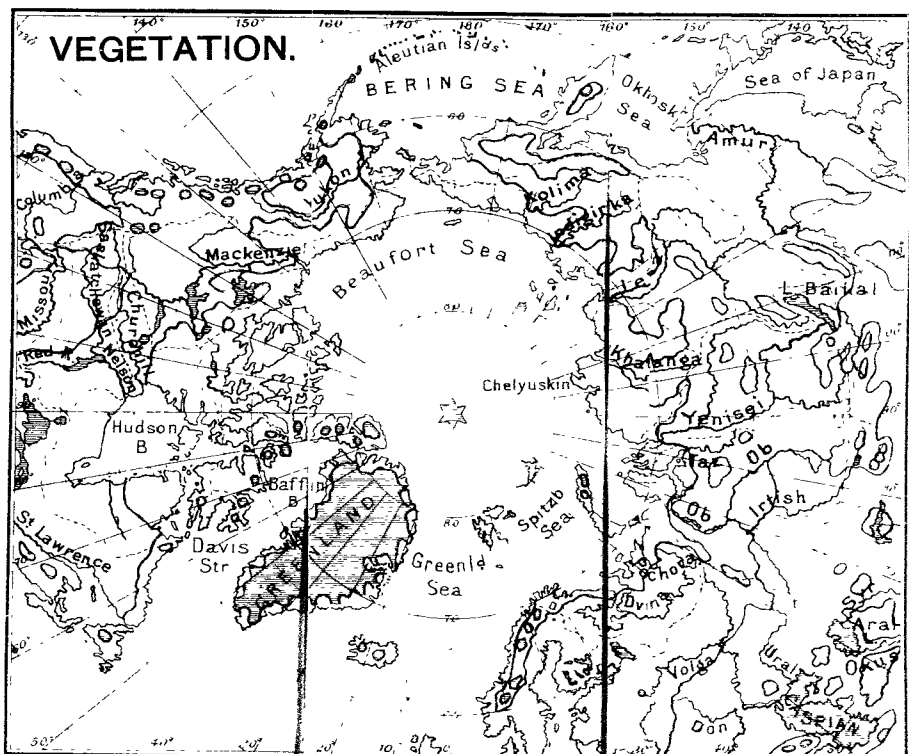
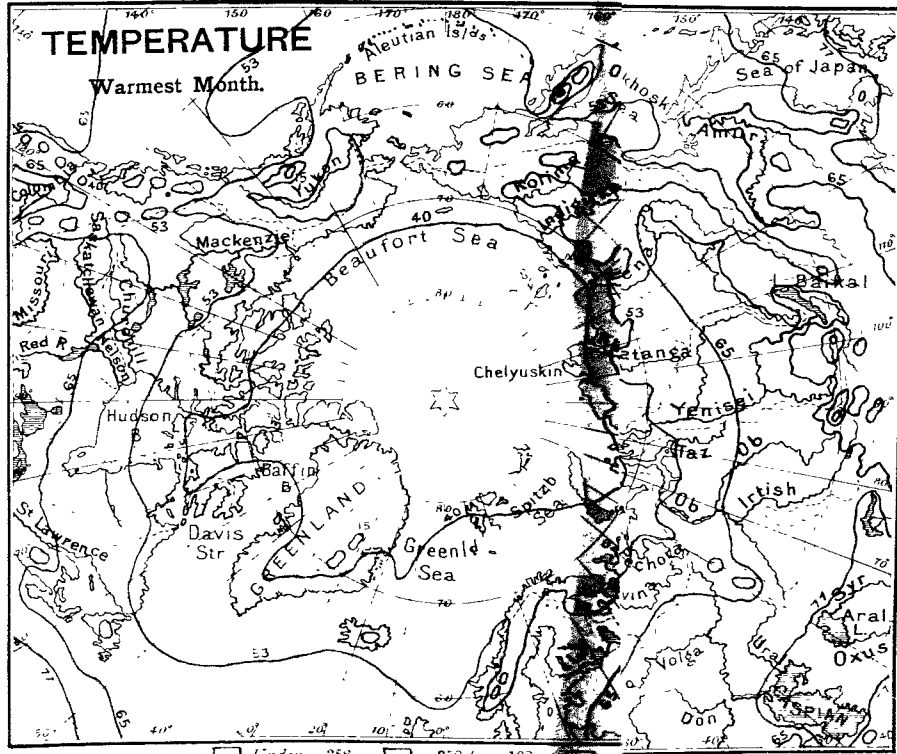
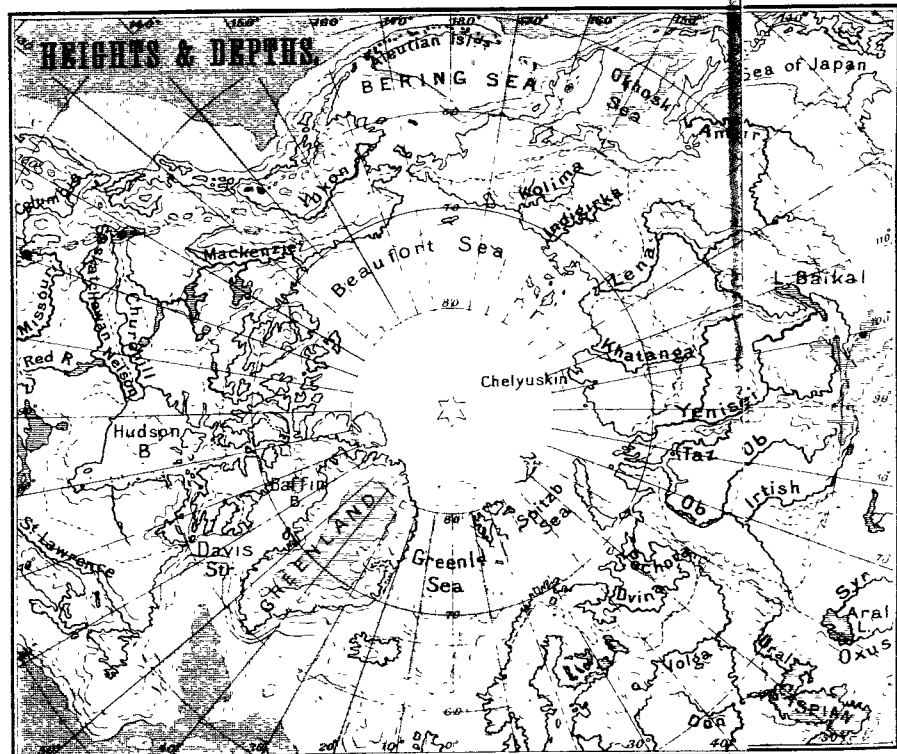
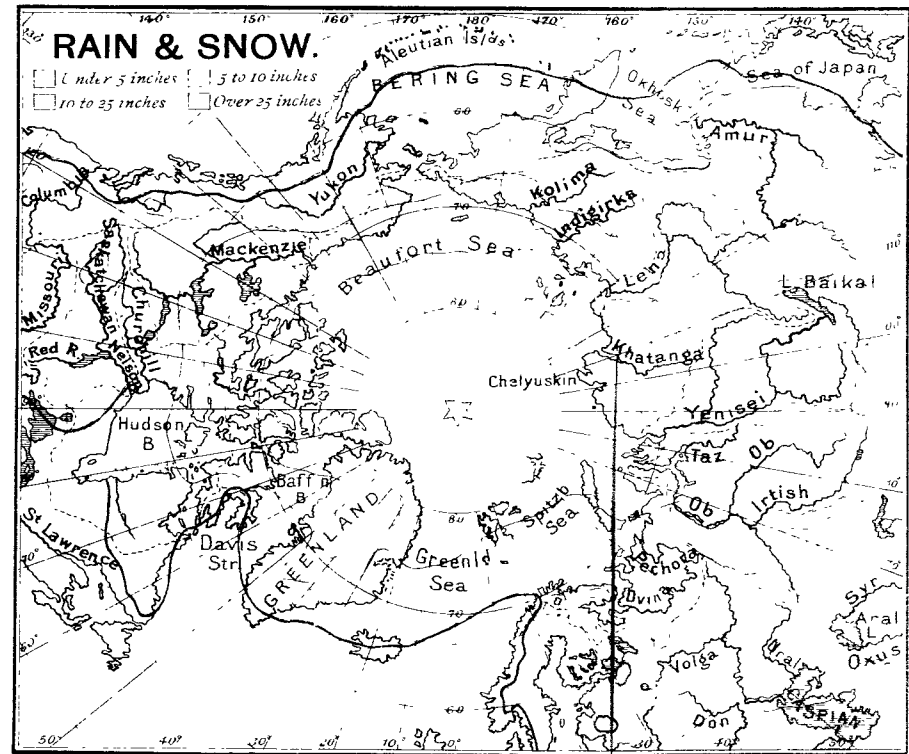
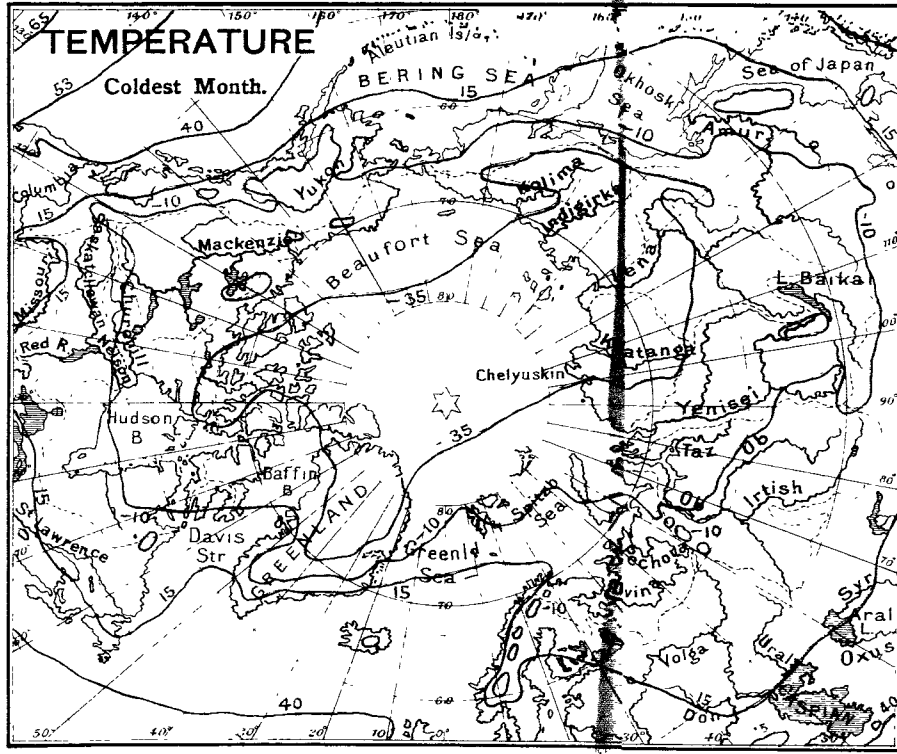
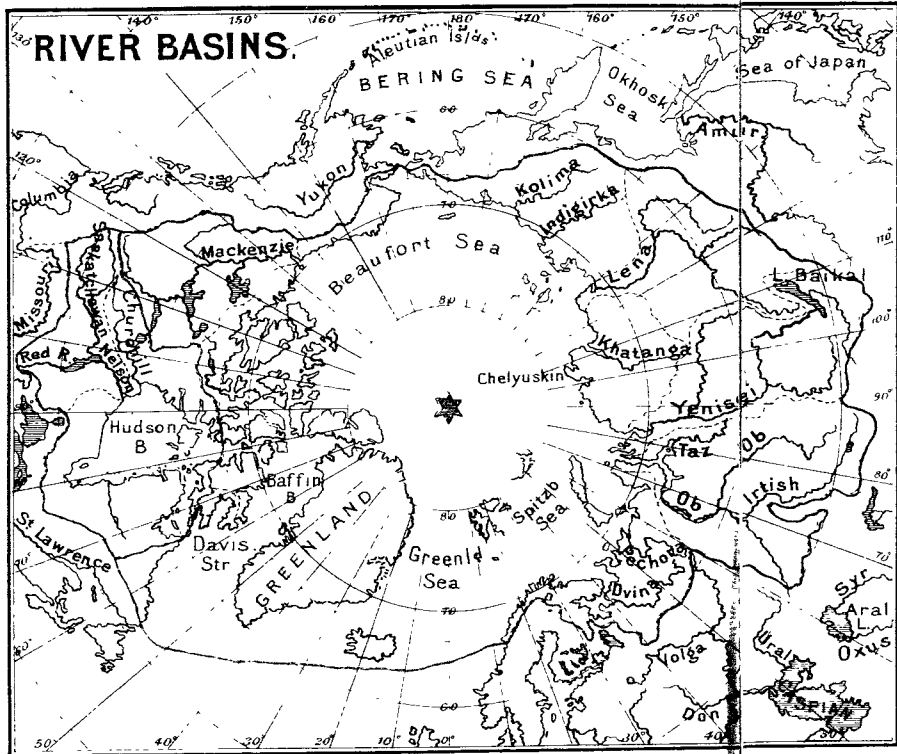
Haussa Country.

Ewart.

Twenty-eight Photographs taken by Major J. H. Ewart in the Haussa Country, West Africa. *Presented by Major J. H. Ewart.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

SIX POLAR CHARTS illustrating Mr. HENRY SEEBOHM'S PRESIDENTIAL ADDRESS, Nottingham, September, 1893.



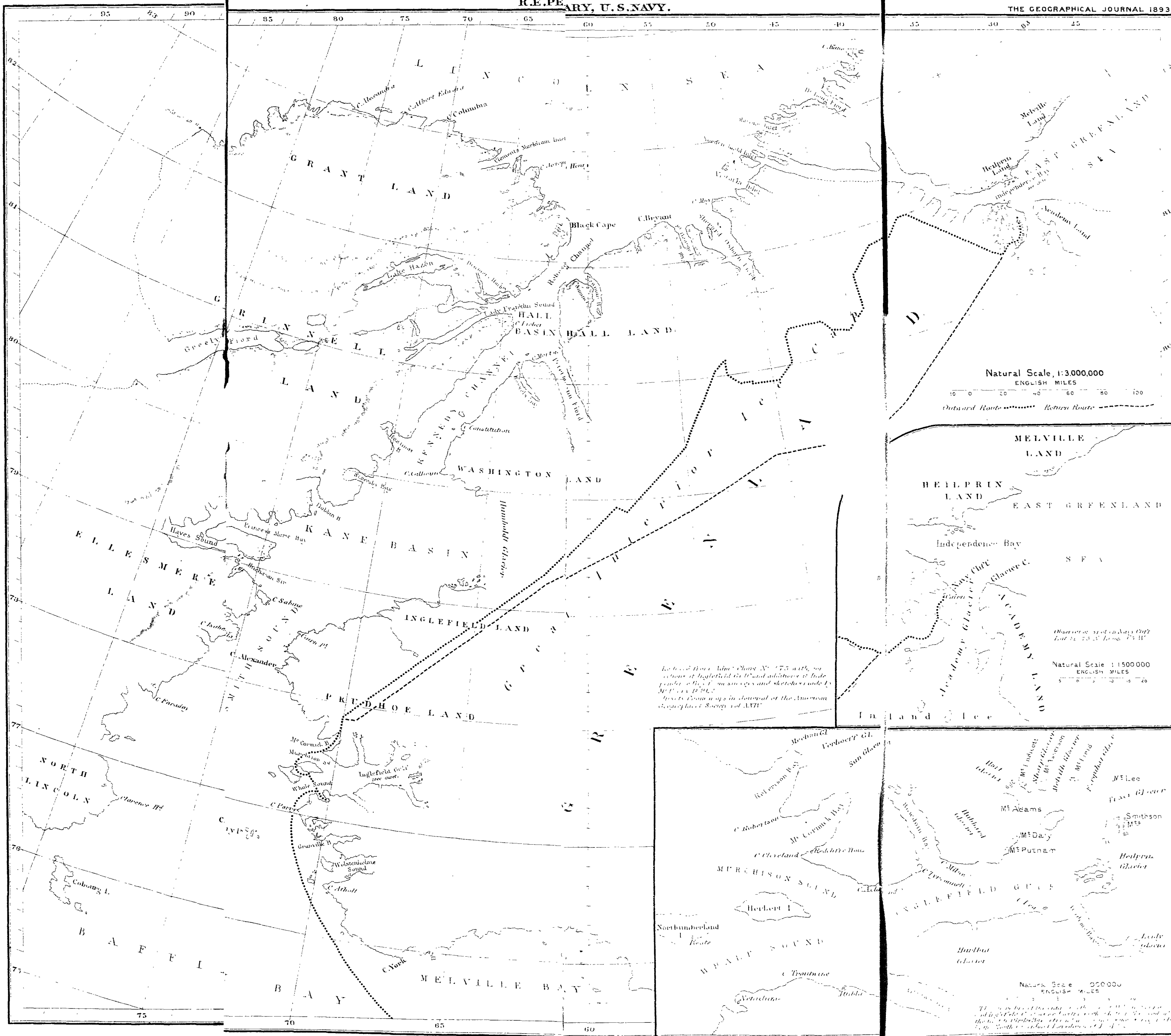
Land: — Below Sea Level — 0-500 ft — 500-3000 ft. — 3000-6000 ft. — 6000-12,000 ft. — Over 12,000 ft.
Sea: — Depth under 100 fath. — 100-500 fath. — 500-1000 fath. — 1000-2000 fath. — Over 2000 fath.

Actual Mean Temperature of Month:
Under - 35° - 35° to - 10° - 10° to - 15° - 15° to 40°
40° to 55° 55° to 65° 65° to 77° Over 77°

Woodland. Grassland (Steppe, Prairie, &c.). Tundra and A.p.n. Desert
Snow and Ice.

R.E. PE ARY, U. S. NAVY.

THE GEOGRAPHICAL JOURNAL 1893



The Geographical Journal.

No. 5.

NOVEMBER, 1893.

VOL. II.

JOURNEYINGS IN THE PAMIRS AND CENTRAL ASIA.*

By The Earl of DUNMORE.

LANDING at Karachi early in February 1892, I proceeded up country, *via* Multan, Lahore and Jhelum, to Rawal Pindi in the Punjab, where I commenced making preparations for an expedition to the Pamirs and other parts of Central Asia by way of Kashmir and Western Tibet, and over the great mountain ranges of the Eastern Himalayas and Mustagh or Ice Mountains into Chinese Turkistan. I reached Kashmir in April, and Leh in Ladakh in the end of May. There I was joined by Major Roche of the 3rd Dragoon Guards, who had obtained a year's leave, but although he had a permit from the Government at Peking to cross the Chinese frontier, he unfortunately was not able to procure one from St. Petersburg to enter Russian Turkistan. We purchased fifty-six strong wiry little Ladaki horses or ponies, and engaged thirty picked men (Argoons), all old hands, some of whom had accompanied those intrepid explorers, Captains Bower and Younghusband into Central Asia, and who in addition to being first-class caravan men, combined also the various trades of shoeing-smiths, pack-saddle makers, shoe-makers, Durzis, etc.

Our caravan being fully equipped, horses properly shod, etc., we marched out of Leh in June rather an imposing company, as we had requisitioned seventy yaks to accompany us over the Kardung Pass, the gate of the Eastern Himalayas, that pass being impracticable for laden ponies. The regular trade caravans going north never attempt the passage of the Kardung before the middle of July on account of the snow, but we managed with very little difficulty to cross it on June 23rd.

Crossing the Shyok River, we passed through the Nubra Valley, struck the Tutialak River, crossed the Great Sassir Glacier, camping at

* Read at the Royal Geographical Society, July 5rd, 1893. Map, p. 480.
No. V.—NOVEMBER, 1893.]

a height of over 18,000 feet, we eventually found ourselves on the Great Dapsang Plateau, which we named the "roof of Asia." Ascending an unnamed pass of 18,330 feet, to which we gave the name of Peymalaptse (the Tibetan for butterfly), after a beautiful butterfly we saw on the summit, we were much astonished to find no descent on the farther side. It was exactly like going up a ladder and stepping on to the flat roof of a house, for from the summit of the pass we stepped on to this level table-land, a burning desert of sand and shingle, strewn with the bones of animals and bleached skeletons of horses, and notwithstanding the high altitude absolutely devoid of snow. This plateau extended north for 26 miles, and as far as we were able to judge was about 40 miles from east to west.

Thence we descended to the Chip-chak River, and rode up the Karakoram River, camping at the foot of the great pass at an altitude of 18,000 feet, the highest altitude we ever slept in. On July 9th we made the passage of the Karakoram, about which we had heard so many astounding tales, and having crossed a great many passes since, and a few before, I have no hesitation in saying that out of the many we had to negotiate between Kashmir and the Tian-shan mountains on the Russo-Chinese frontier, this pass was one of the very easiest. I do not think any one knows the exactly correct height of it. I believe the last time the altitude was taken officially was twenty years ago by some of the officers attached to the Forsyth Mission to Yarkand, with I believe a mercurial barometer. We took the height with aneroid barometers—two of Negretti & Zambra's newest and best instruments—and made it 18,880 and 19,100 feet; and the Russian traveller, Prince Galitzin, told me he had taken it with the boiling-water test, and made it 19,050.

On entering the pass we came upon the remains of forty-one horses and one human being, so that, under certain conditions, there is no doubt that the pass may be a deadly one. One of our horses fell down dead on the far side of the pass. On leaving the summit we were joined by a pair of old ravens, who live there, and attach themselves to each caravan, following it north as far as the Chinese frontier fort of Suget, where they invariably take their leave, and fly back to their home on the Karakoram. The caravan men were very superstitious regarding these birds, who did accompany us all the way to the Chinese frontier, and we used to put food out for them every night and morning.

On the north side of the Karakoram the Yarkand River has its source; and not far from the water's edge, about half-way down the pass, stands the cairn erected by Captain Bower to the memory of Andrew Dalglish, the Central Asia trader, who was treacherously murdered by a Pathan, the words, "Here fell Andrew Dalglish, murdered by an Afghan, April 6th, 1888," being carved in English and Persian on a marble slab which surmounts the cairn of rough stones which marks

the spot of the murder. I met Captain Bower the other day in Simla, and he was very much interested to hear that the monument was still standing, as he feared it might have been swept away by the melting snows.

For the next four days we gradually descended, following the course of the Yarkand River until it lost itself to view, flowing, as it does, for some miles underground, to reappear again under the guise of about one hundred bubbling springs of clear water, contained in about an area of two acres of ground.

During these four days our lowest altitude was 16,800 feet; and on the fifth day we crossed the Chinese frontier, over the Suget Pass of 18,680 feet, in a snow-storm, and, descending 5500 feet, found ourselves in two days at the Chinese fort, where we were hospitably entertained by the commandant, Ching Dolai. Here we had hoped to have been able to re-provision the caravan for a two months' march on to the Pamirs; but the Chinese either could not or would not provide us with the large amount of flour and grain we required. The consequence was, we had no choice but to proceed to Yarkand, and try and make the Pamirs from there.

While at the fort we heard that the Kilian Pass was not practicable, owing to the great amount of snow. So we settled to go by Sanju, a route which, Ching Dolai informed us, was closed by special order of the Emperor of China, owing to raids made by some wild tribesmen on caravans, the last of which resulted in the murder of some Yarkandi merchants and the selling of their caravan men into slavery. We were, however, determined to pursue this route, and risk meeting these freebooters, telling Ching Dolai that we were a strong party, well armed, and quite able to take care of ourselves.

So we rode up the valley of the Karakash River for four days, through magnificent scenery, until we reached the Boschut defile, which narrow, steep, and uncompromising gorge was the entrance to the Grim Pass.

I forgot to mention that the morning we left the fort the two Karakoram ravens sat perched on some rocks, watching the men loading the ponies; and when we marched, they spread their wings, and flew in the opposite direction, presumably back to their home on the Karakoram.

We made the passage of the Grim in a thick snow-storm, the altitude being 17,330 feet, the last 1000 feet of which was as difficult as it was dangerous for the transport animals, the yaks lying down and refusing to move, and even the unladen ponies showing the same signs of distress. At one time I thought we should be beaten back; but by dint of sheer hard struggling, not unattended with danger to both man and beast, we managed to reach the summit of the pass (which is in reality the summit of the mountain), and found ourselves on a razor-

backed ledge, where there was barely foothold, so narrow and sharp was the top. As it was snowing hard and very thick, we could see nothing in front of us but a fearful-looking precipice, down which we had to descend in a thick mist. When we with extreme difficulty, and at the risk of breaking our necks, got down about 2000 feet on the north side of the pass, and clear of snow-storm and mist, a sight met our eyes which was as unexpected as it was beautiful and refreshing. Below at our feet lay miles and miles of lovely green downs, the grass growing almost up to the tops of the hills that sloped gently down to them.

Three hours' march brought us to Kichik Ilak, where there was a large Kirghiz encampment, these hospitable nomads receiving us with every demonstration of friendship, and bringing us presents of yak's milk, curds and whey, etc. Having the utmost confidence in these people, we remained in their camp for two days, to rest ourselves, as we had been walking and riding for seventeen consecutive days, at a daily mean altitude of 16,680 feet above sea-level, the distance covered being 258 miles, over eight mountain passes, six of which were over 18,000 feet high.

Leaving our kind Kirghiz friends, we rode for two days down the Sanju River, and on the third day, instead of continuing down the river, following the route taken by the Forsyth Expedition in 1873, we turned off due east up a river called the Arpalek, to explore and, if possible, cross the Chuchu Mountains, and see what lay on the other side of them. Crossing the Arpalek River about one mile above its junction with the Sanju, we proceeded in a north-easterly direction, and, climbing a steep cheraï, found ourselves in a high, narrow defile, which we conjectured must be the entrance to the Chuchu Mountains, which did not appear to us very formidable after the Eastern Himalayas and Kuen Lun ranges. We ascended 3520 feet, and crossed the mountains in the evening of the same day at an altitude of 12,500 feet. It was a long and a steep pull, and several of our ponies came to grief with their loads, and some of the men got hurt trying to save the ponies rolling over the rocks. After a long and weary march of 22 miles over the mountains we halted, and the next day found ourselves in a country sufficiently uninteresting to warrant my not saying anything about it. It was quite uninhabited, until two days later we struck a sort of farm on the Poski River, 20 miles from Sanju. The Poski River being only 9400 feet, we found the temperature warm and pleasant, and the people of the farm very hospitable, but much astonished at seeing a European. Needless to say, we never saw the wild tribesmen, nor do I believe that they exist. Major Roche and I made as careful a survey of that bit of country as circumstances would permit of, a small map together with some photographs and sketches being the result.

Sanju was reached on July 25th, and we arrived at Yarkand early

in August, the distance covered being 953 miles from the start and 790 miles from Kashmir.

Yarkand in ancient times was the capital of the country, and although no longer the metropolis, is still the most popular as well as the most wealthy city in the whole of Kashgaria, called by the Chinese "The New Dominions." Like all cities of Central Asia it is fortified, and like Kashgar has two distinct cities, the old and the new; the former is entered by five gates, and the latter, Yangi Shahr, as its name in Chinese, Mangshin, denotes, is simply a large fort, entered from the east by a double gate over a drawbridge, which spans a ditch 30 feet wide and 30 feet deep. Within this fort are 400 houses, and a population of 2000 souls, whereas the Kuhna Shahr, or old city, and suburbs contains a population of 60,000.

Just at this time all sorts of rumours were flying about the bazaars regarding the movements of the Russians on the Pamirs, the result being that a Chinese force was despatched to that region, and we followed in its rear.

On the second day out we marched across the Desert of Shaitan Kum, after emerging from which we entered a mountainous country again, and passed through many curious defiles, where in some places the stupendous rocks on each side almost met overhead.

On August 22nd we crossed the Kara Dawan, or Black Pass, and found ourselves overlooking the most gigantic basin, in which we counted thirteen small ranges of mountains between us and the blue haze that enveloped the far hills. The descent of 2500 feet was very steep, and we had as usual to make it on foot leading our horses.

The black shale over which we travelled showed plainly the presence of coal and iron, the sides of the hills being streaked with unmistakable veins of those valuable minerals. We soon came to a dead-lock at the far end of the ravine in the shape of a high waterfall, the stream that we were following tumbling over an apparently white marble precipice several hundred feet deep. With difficulty we made our way down a steep zigzag path to the bottom of the waterfall, the water of which was quite salt. All around lay the dead horses of the Chinese, who had been less fortunate than ourselves in making the perilous descent.

Next morning we rode down the Kiaz River, through the yellow hills that give to Sari-kol its name, "Sarig" meaning yellow, and "kol" the Kirghiz name for a wide valley, as distinguished from "gilga," a gorge—not "kul," a lake. Thence through sparsely-cultivated valleys where the natives were busy threshing their corn, the process being as follows: the corn is laid down on the ground and a pole stuck in the middle of it, to which is attached six donkeys and four cows abreast; a boy runs behind with a whip, and the animals trot round and round the pole, treading out the ears of corn as they go.

At the junction of the Kiaz and Charlung Rivers we altered our course from south to west until, after two days' riding, we reached Chehil Gumbaz, where stands an abandoned fort built by the Chinese.

At Tashkerim we came across the Chinese troops, who, having left Yarkand with the ostensible object of marching on to the Pamirs, had taken up a permanent position at this spot and never got any further. Rejoining Major Roche about a mile from the Chinese camp, we continued riding up the river, gradually ascending from 6700 to 10,800 the elevation of Chehil Gumbaz, and the following day crossed the Tarut Pass, 13,600, ascending 2800 feet in $2\frac{1}{2}$ miles, or nearly 1 in 5.

The next day we journeyed up the Toilobolong River through the wild and almost impassable ravine which bears the same name. After some hours of break-neck work, ascending 4000 feet the while under a burning sun, we found ourselves on a piece of open tableland at an altitude of 13,800, a plateau of rough coarse grass and granite boulders, and in front of us rose the great snow-clad Mountains of Sarikol, the eastern barrier of the Pamir region. After leaving this plateau, we kept ascending until the cold of the declining day became almost as severe as the noonday heat of the defile had been intense.

About midday next day we came upon a beautifully clear sheet of water, out of which the Yambulak River flows. This lake was surrounded on three sides by stupendous cliffs, rising sheer up 2000 feet from the water's edge, one huge glacier standing out in bold relief in the middle of them, which doubtless gave to the water the most beautiful emerald hue I ever saw. The altitude of this lake, which we took to be the Yambulak, as it lies so near the pass of that name, we made 15,800 feet, and the summit of the pass beyond it 16,530.

The sides of the pass were deep in snow, and the strong north-east wind that we met on the summit did not improve matters in the way of temperature. We had to undergo one of those violently rapid changes of temperature so trying to men even in the rudest of health, there being a difference of 91° between the heat of the plain and the cold of the camp in the morning. After much difficulty and suffering we reached Tashkurgan in two days.

Tashkurgan, meaning stone fort, is the capital of Sarikol; it is but a small village, and the Chinese fort, which gives it its name, stands on a piece of rising ground on the left bank of the river, which rejoices in several names, the proper name being the Taghdumbash River. The fort is manned by eighty-eight men, one officer, and no guns. The population of the Sarikol district numbers six thousand souls and is purely Aryan. The people belong to the Shia sect of Mohammedans, and their language is the same as that of the Shighnanis, from which western district of the Pamirs they originally migrated.

We remained a day or two at Tashkurgan to re-victual the caravan, and also to give the sick men a rest; and, after riding up the left bank

of the river in a southerly direction for three days, arrived at the dilapidated Fort of Ujad Bai, which stands at the fork of the Khunjerab and Mintaka Rivers. Striking off to the westward from this point, we entered the Taghdumbash Pamir, and, after three days more riding, established ourselves in a permanent camp on the Kukturuk River, where we remained for fifty-five days. It was owing to our camp being laid out on military lines on a square 60 yards to each face, and our making a road round it and building a stone kitchen in the centre that gave rise to the rumour that the English had built a stone fort on the Pamirs, and caused a Mandarin to travel from Kashgar, fifteen marches to our camp, only to find the stone fort was a kitchen. Our caravan, which by then mustered sixty horses, and with Kirghiz followers about forty men, was also magnified into an armed English force. The Chinese were very jealous of our having established ourselves on their Pamirs, and gave orders to Osman Beg, chief of the Kirghiz of Mintaka, not to supply us with any food for men or horses in the hopes of starving us out of the country, and as soon as we struck our camp in October they demolished our stone edifice, still believing it to be a fort.

The weather began to get very cold at the latter end of September and beginning of October, the thermometer registering minimum temperatures of from 5° to 8° below zero every night, and sleeping out without a tent up in the hills, when shooting *Ovis Poli*, was rather cold work. During our stay in the permanent camp, we made several exploring expeditions, amongst others, crossing the Hindu Kush by the Kilik Pass, which we found was a shorter way to Hunza and Gilgit by three days than over the Mintaka Pass, which is the usual route.

On hearing that the Russians had turned the Chinese out of Aktash, a fort at the east end of the little Pamir, and demolished it, I resolved to go and verify the statement, which, like all Kirghiz rumours, had to be taken *cum grano*. So, leaving Major Roche at the permanent camp, I started with five men for the valley of the Aksu River, and, crossing the Beik Pass, 16,370 feet, arrived after four days' marches at the Fort of Aktash, which I found in ruins, not one stone standing upon another.

After my return to the permanent camp at Kukturuk, we struck our tents and started for the middle and upper Pamirs, riding in a westerly direction up the valley of the Wakhjir, having previously despatched those of our sick who could not stand the cold of a Pamir winter across the Hindu Kush to Gilgit.

We crossed the Wakhjir Pass, 16,680, which is the frontier between Chinese and Afghan territory, and when we descended and struck the Ak Bilis River, we found ourselves in the Wakhan district of the Pamirs and within the dominions of the Amir of Kabul. Riding for two days down the Ak Bilis River we reached Bozai Gumbaz, a now historical spot, as it was there Captain Younghusband's progress was arrested by the

Russians in 1891. From there we proceeded east, to the Chakmak Kul, and passing the source of the mighty Oxus which we claim to rise simultaneously with the Aksu River at the east end of the lake, we crossed the mountains of the little Pamir by the Andamin Pass (15,150) and debouched on to the great Pamir Plateau in a heavy snow-storm. It was just before crossing the pass that we came across a bare, gaunt, hungry-looking dog, who, having lost his Kirghiz or Dakki master, attached himself to our caravan and soon got quite tame. To him we gave the name of Pamir.

Our objective point after entering upon the great Pamir was Wood's Lake, now called the Victoria, and what between the stupidity of Abdul Kerui, a Kirghiz who pretended to know the locality of the lake, and the advent of a heavy snow-storm, during which we lost our caravan, we found ourselves at night (November 4th) on the bank of the Chistoba River, a long way north-east of the lake and well out of our course. The next morning we worked our way by compass and crossed a small pass, 15,130, which for want of a better we named the Fox Pass, as our dog Pamir ran one to earth on the summit. In the evening we came within sight of a lake which turned out to be one of the small lakes, the western extremity of which lies about $3\frac{1}{2}$ miles from the east end of the Victoria, which lake we sighted next morning. We rode along its north shore for two days making short marches, as our mornings were occupied taking observations, sketches, and photographs.

On the third day we camped about 8 miles down the Pamir River, which flows out of the west end of the lake, and forms a junction with the Ab-i-panj at Langar Kisht, and is, therefore, a tributary of the Oxus.

As we lost twenty-three of our horses during the night, it was late before we recovered them, and were able to make a start to explore the mountains between the Khargosh Pass west, and the Bash Gumbaz Pass east, our object being to discover a pass that led straight from the west end of the Victoria Lake over the mountains to Yashil Kul, a lake lying at the west end of the Alichur Pamir. So choosing an open-looking, but very stony nullah, we rode up it due north for 8 miles until we came on to a circular plateau in the midst of wild stony hills, altitude 14,900. In front of us was a ridge which we took to be a watershed, but on reaching the summit (15,230) we saw we were mistaken, as $\frac{3}{4}$ mile farther on was a narrow pass, on the summit of which (15,700) was a small but perfectly square frozen lake, and its peculiarity lay not only in its perfectly rectangular shape, but in its close resemblance to an artificial reservoir, its sloping sides being paved by nature with flat stones fitting closely together, giving it all the appearance of a piece of solid mason work. We therefore named it the Hanz-Dawan or Reservoir Pass. From the Hanz-Dawan we descended in two marches on to a flat sandy desert, 300 feet below which was a large basin extending

east and west for miles. In it were four lakes: one, the Sasik Kul, 3 miles long by 1 broad; two, the Tuz Kul, and two smaller ones, the last being the Khargosh-Kul at the end of the stream running from the Khargosh Pass. The altitude of these lakes was 13,400 feet, and the whole basin which contained them was encrusted with saltpetre. Rising onto a ridge we came to another small pass which we named Guljia-Dawan, from the large amount of horns and skulls of these animals (*ovis poli*) that we saw lying about. From this pass, which is not marked on any map, we had a fine view of the hills of Shighnan. We reached Bulun Kul, 13,200 feet, and camped at an abandoned Afghan outpost. The next morning (November 9th) we pushed on to Surmatash, skirting the shores of the Bulun Kul, until we came to the river which connects the two lakes—Bulun Kul and Yashil Kul. In none of the maps are these two lakes made to have any connection with each other, whereas they are in point of fact almost one, the little river which connects them being but $\frac{1}{2}$ mile in length. Bulun Kul lies south-east of the Yashil Kul. This latter lake is the next largest on the Pamirs to the Kara Kul, being about 16 miles long. It lies east and west. The Ghund River, which rises at the west end of the lake, flows into the Ab-i-Panj, and is one of the many tributaries of the Oxus.

Surmatash is the spot where only a few months before the unfortunate conflict took place between the Russians and Afghans, concerning which (as it comes under the heading of politics and not geography) I shall be mute. Close to the scene of the fight we found four Afghan great coats lying on the ground; they were all more or less blood-stained, and on examining them closely could see pretty clearly how their ill-fated owners had met their deaths. One had seven bayonet or lance thrusts through it. Another had the left arm almost severed through at the elbow, and the other two were in worse plight. The dead Afghans were all buried in one grave on a hillock just above the river. They are not interred, but all huddled up together inside an enclosure composed of four low walls built of rough stones. Over the bodies have been thrown two namdahs, over which some mud has been sprinkled, the whole kept down by five large stones to prevent any beast of prey from scraping up the corpses.

Leaving this now historical spot, we marched for five days through the Alichur Pamir along the river of that name, arriving on the third day at the Nezatash Pass, 14,430 feet. There we fell in with a Cossack patrol, who finding one of our men looking for a stray horse, took him to be an Afghan and threatened to shoot him, but on seeing us approaching left him alone.

Two days after crossing the pass, we arrived at Murghabi, Colonel Yonoff's head-quarters, where we were very well and hospitably received by the Russian officers in charge of the fort, as the Colonel had just left for Tashkend. There we remained for two or three days,

as our kind hosts would not hear of our leaving them, and we soon became the best of friends. At the end of November we marched to Rang Kul, another smaller Russian fort, accompanied by Captain Brjesicki. We camped one night at Ak-Baital, where I was much amused at over-hearing the following conversation between Major Roche and Captain Brjesicki. The former was asking the latter in French the meaning of the word Ak-Baital.

Brjesicki, whose knowledge of the French language was limited to about half-a-dozen words, one of which was "*cheval*," was cogitating deeply how to translate the word, Baital (a mare) into French. He knew that Roche understood the meaning of the prefix ak (white), but how to convey the translation of the word Baital. At last a bright thought struck him, and he exclaimed triumphantly, "Baital—*Madame Cheval*."

The next afternoon while riding along the southern shore of the frozen Lake of Chor-Kul, we came upon the curious Lamp Rock. On reaching the end of the Chor-Kul, which is from 6 to 7 miles long, we came upon the Rang Kul, another smaller lake, separated from the Chor-Kul by a quarter of a mile of land, no stream even connecting the two pieces of water; and yet on most of the maps they are represented as one large lake under the name of Rang Kul.

It was a bitter cold ride of 28 miles from Ak Baital to the Russian fort, where we arrived three hours after dark, with the thermometer at 15° below zero. There was but a small force of Cossacks there under the command of two officers, who made us most welcome, and administered as best they could to our wants.

The next day we found the thermometer had been as low as 25° in the night, and we all agreed as to Rang Kul being the coldest place on the Pamirs. One of our horses died of cold the day before. The fort is situated at an elevation of 13,500 feet above the sea, on the edge of an immense plain.

In the afternoon of the second day we spent with our kind hosts, the weather gave us some sort of idea of how cold it could be, as the thermometer fell to 10° below zero in the afternoon; so we had recourse to various expedients to keep ourselves warm. We were genuinely sorry to leave our hospitable quarters and the cheery good fellows who had been our hosts, but December was fast approaching. We started the next morning and marched to the foot of the Ak-Berdi Mountain, crossing the Kokbeless Pass, 15,300 feet *en route*, from the top of which we had a splendid view of the great Mustagh-Ata, whose rugged ice-bound peaks rose some 25,800 feet into the wintry sky.

The Ak-Berdi being the Russo-Chinese frontier Captain Brjesicki bade us adieu there, and we commenced to make the ascent of this mountain, which was deep in snow, the last 1500 feet of which was as bad as the Grim Pass, and we had no yaks. The cold was intense,

with a north-east wind blowing the loose snow into our faces. We managed after several hours' struggling to get over the summit (for there is no pass), and the next day we reached the Chinese fort of Bulun Kul where we remained for the night in a Kirghiz Akoi. Here we had some difficulty in persuading the Chinese officer to allow us to pass.

Riding for 8 miles along the shore of the Bulun Kul Lake and passing the second Chinese fort at the north-east end of it, where the Gez River has its source, we entered the Gez Defile and camped at the first convenient spot. The river runs through a deep narrow gorge on the left of the track which is impossible to see in some places, and which leads over miles of stones and rocks all heaped up in wild confusion, intersected every now and again by deep and almost impassable dry watercourses, all the result of recent landslips. The next day it blew a gale and the landslips were too frequent to be pleasant.

That night we camped near some hot springs. The third day the defile widened out a little and opened up fresh beauties to our appreciative eyes at every turn, as we proceeded further eastwards. The scenery, in fact, became so savagely grand that we ceased to grumble at the roughness of the country over which we were travelling, and at our very slow means of progression, viz., 19 miles in two days.

Rounding the base of a huge rock we suddenly came face to face with a scene which will live for ever in my memory. To attempt to faithfully describe its chaotic magnificence is almost impossible. Picture a background of wild rugged mountains, whose snow-peaks towered into the sky. Rocks of every fantastic shape, with huge festoons of icicles hanging from their jagged edges; ice-bound torrents and frozen waterfalls; huge boulders thrown about in the wildest confusion, the whole foreground seeming to have been lately subjected to some mighty convulsion of nature, and then you can form no idea of the savage splendour of this scene of chaos. After gazing for some time with awe and wonder upon this enthralling picture, whose weird beauty was enhanced by a diaphanous haze which floated over it all, we rode on towards the distant blue hills which marked the termination of this wild gorge.

Three days later we reached Kashgar in the evening, where we were hospitably entertained by Mr. Macartney, the English Political Officer there.

During our stay in Kashgar we visited the few places of interest that the country could boast of.

About December 10th both our caravans were re-provisioned and the horses re-shod. (I say both our caravans, because it was here that Major Roche and I had most reluctantly to part, as he could not cross the Russian frontier. So we divided the caravan up, drawing lots for the fifty ponies, thus having twenty-five each.) And we each made a start, he east, to Maralbashi, in the hopes of shooting a long-haired tiger

before returning to Gilgit, and I north-west, towards the Tian Shan Mountains, that divide the dominions of the Emperor of China from those of the Czar. As heavy snow had been falling for some days, fears were expressed at Kashgar as to the feasibility of my crossing the mountains. However, taking with me only eight of our Tibetans, I made a start, leaving behind me, with much regret, Ahmed Din, my interpreter, who had been appointed as munshi to Mr. Macartney, at Kashgar, and could, therefore, proceed no further with me.

The first night I halted at the village of Sulok, and next day continued riding over the dreary plain in a north-westerly direction, passing the old fort of Andijan Kichik, making but little way, as the snow was up to the ponies' hocks. In the evening we left the plain, and, striking the Mingul River, rode up the little valley until we reached a long, low, rambling fort, where we halted for the night.

Crossing the Mingul we proceeded by and across the Kan-su Pass. On the fifth day from leaving Kashgar I arrived at the Kirghiz encampment of Uksalar.

There we stayed two days and then crossed the head-waters of the Kizil-su to the Chinese frontier fort of Ulukchat, which stands some little way up from the river.

Two days later I reached the Russian frontier fortress of Irkishtan, having spent one day in hawking partridges at Yaghan with the Beg of the Kirghiz, who had some fine, well-trained hawks. Irkishtan is prettily situated on a promontory overlooking the River Chenksu, and I was most hospitably entertained by the Cossack officer there for two days; and when I continued my journey he insisted on escorting me with thirty of his men for about half a day's march. The escort, mounted on their little shaggy horses, rode in fours, singing all the time, the rocks echoing back the music of their wild songs, which were extremely tuneful and very well sung.

On December 22nd, I found myself in the heart of the Alai Mountains in very deep snow and with the thermometer varying from 20° to 35° below zero. I crossed three passes—the Kok-Bel, 11,950 feet, the Ek-Zek, 11,600, and the Borak, 11,550, all of them very difficult ones owing to the mass of ice that covered them. On Christmas Eve the temperature fell to 38° below zero, and I woke to find three of my horses lying frozen at my tent door. One was quite dead, the others never recovered. On Christmas Day I made the passage of the great Terek Dawan on foot; it was one mass of snow and ice. It is barely 14,000 feet in height, but the descent of 5350 feet was very steep and a sheet of ice, the last 1000 feet being accomplished by moonlight. It is considered the worst pass in the Alai Range. After marching for two more days, I arrived at the second Russian fort of Gulcha, where there were about forty Cossacks. I was much struck with the neatness and cleanliness of their stabling accommodation.

Crossing three more passes, all small ones, and riding through a magnificent down-country, I arrived at Osh in Ferghana, where I was hospitably entertained by Colonel Grombchevsky, who has lately been appointed to the command of the district.

At Osh I sold my horses, tents, and camp equipage, having no more use for them, as the remainder of my journey through Russian Turkistan was accomplished in Tarantass and in sledges. I also parted from my faithful Tibetans, to each of whom I made a present of a pony to ride back to Kashgar, where they intended to remain until the first caravan set out for Ladakh. A better set of men, a hardier or a more willing I have never met with, and during the whole eight months they were with me I never once had to punish any of them or cut them a single rupee of their wages. I also include in this most of the men whom I left with Major Roche. Raudzan, who was our head caravan man from start to finish, I took on with me from Osh through Russian Central Asia until I met Mr. and Mrs. Littledale on their way to Pekin, when I handed him over to them, as they had been disappointed in obtaining the services of another man they had wanted, and I was able to tell them honestly that I considered they had in Raudzan one of the best men in Central Asia.

From Srinagar in Kashmir to Osh in Ferghana, following the route we were forced under the circumstances to take, we had travelled for nearly nine months on horseback, and on foot 2006 miles over thirty-nine mountain passes, some of these amongst the highest in the world, and across sixty-one rivers, during which time I am thankful to Providence we never lost a man and only seven horses.

It is unnecessary to describe here my journey through Russian Turkistan. Let me, however, state that from the time I entered the Central Asiatic dominions of His Imperial Majesty the Czar, until I quitted them, the extraordinary civility I received from high and low, the warmth of the hospitality that was accorded me by all officers from the Governor-General downwards, was so marked that as long as I live I shall not only never forget it but it will be always to me more than a pleasant experience to look back to. Being slightly acquainted with the language helped me not a little, as in the out-of-the-way districts, such as the Pamirs and frontier forts, none of the officers spoke either English, French or German.

Leaving Osh and my good friend Colonel Grombchevsky, I proceeded by Andijan to Marghilan, Khokand, Khojend, and Tashkend, being snowed up more than once.

It was now the middle of January, and my object was to get to Khiva, going round by Kasalinsk and the Sea of Aral; but the Governor-General, Baron Wrewsky, whose guest I was, pointed out to me how hopeless it would be to attempt such a journey at that season of the

year, especially as the Oxus was closed for navigation owing to the ice, and to attempt a land journey in the snow over the Khivan desert in this, the most severe winter known in Central Asia for years, would be little short of madness ; so I had most reluctantly to give it up as a bad job. Day by day the weather got more and more severe, and the snowstorms were frequent until at last the mails ceased to run, as the roads were all blocked. Telegraphic communication alone remained open, and that at last was closed ; but not before I discovered by means of the wires from Askabad that my long-cherished plan of crossing the Persian frontier over to Meshed, and so working my way down the Afghan frontier, and through Beluchistan to the Persian Gulf was also knocked on the head, all the roads and passes over the mountains being so deep in snow that I was unable to procure a caravan of camels or any other beast of burden to cross the hills into Khorasan ; so I determined, as soon as the roads were open across the Steppes, to proceed to Samarkand and take the Transcaspian Railway to Uzunada, cross the Caspian to Baku and take boat from there to Enzeli, ride to Teheran, and so on to Bushire, and reach the Persian Gulf that way. It was on the last day of January that I left Tashkend and started for Chinaz. Through the gorge of Jilan-uti we gradually descended till we reached the valley of the Zarafshan, and shortly afterwards the domes and towers of Samarkand came into view, lit up by the golden rays of a winter sunset.

Leaving Samarkand by the Transcaspian Railway, I arrived at Bokhara the next day, then crossed the Oxus at Charjui, and so over the sandy waste that forms the south end of the Khivan desert, to Merv, Askabad, and the Caspian. All this part of the country has been so well and graphically described by Mr. Curzon, that recapitulation on my part would be worse than useless. Suffice it to say that I crossed the Caspian to Baku, arriving there the very day the boat had sailed for Enzeli, and there was not another for a fortnight. The prospect of a fourteen-days' sojourn at Baku was not agreeable, so I went on to Tiflis, that I had not seen since 1859, when it was but a very small town, and so to Batum, where I took the steamer to Constantinople, and returned to India, landing at Karachi in March 1893, just thirteen months since I had landed there in February 1892.

Before the reading of the paper, the chairman, General STRACHEY said:—The Earl of Dunmore will now read you the account of the remarkable journey he has made during the past year, starting from the Indian side of the Himalaya Mountains, going through to Yarkand, thence into the Pamirs, from the Pamirs back to Kashgar, and from Kashgar through Russian Turkistan to the Caspian. I will leave you now in the hands of Lord Dunmore, who I think will give you an extremely interesting account of this journey.

After the reading of the paper, the following discussion took place:—

Mrs. BISHOP: I was not prepared to speak on this question, but as I have

followed the route as far as the Karakoram Pass, I am extremely interested in all Lord Dunmore has said. One or two questions I should like to ask if I may. I should like to know at what height the vegetation ceased on these high passes which he crossed? In my own experience in crossing the Digar and the Kardong glacier pass, edelweiss in enormous quantities covered the whole of the hill-sides in June at a height of 15,000 feet, and from that up to 16,500 feet, beyond which vegetation, except lichens, ceased altogether. I should much like to hear whether he made any observations on the vegetation of the north and south sides, and I should also be interested in knowing whether he observed the range of the thermometer between noon and midnight at heights of 15,000 feet and upwards? I registered solar temperatures of 157°, which was only I think 32° below the boiling-point of water at the same altitude, but the thermometer at midnight fell to 24°, showing an enormous range in twelve hours; and it has occurred to me that the extraordinary disintegrations of the mountains which one sees in Nubra, and specially in the gigantic mountains at the bend of the Shyok may possibly be attributed to these very rapid changes in temperature, occurring in such a dry climate as that of Western Tibet. I should like exceedingly to have some light thrown upon these two subjects—vegetation and temperature?

Sir THOMAS GORDON: As an old traveller in the Eastern Iceland, that wilderness of snow and ice, of which Lord Dunmore has given us a flying account to-night, and shown us some interesting sketches, I should like to say a few words. I wish to speak in praise of the splendid energy which he and Major Roche showed in pursuit of science and sport. We have seen the magnificent *ovis poli* heads in the next room, the result of forty-five days' stay in the Tagh-dumbash. I think we must all admire the spirit of enterprise and resolute determination, the love of adventure and sport, and the great powers of endurance the travellers showed in their very severe journey. I have some personal knowledge of the difficulties to be met with in that country. I should like, however, on the part of the Yarkand Expedition, to disclaim all responsibility for those astounding tales which Lord Dunmore heard regarding the Karakoram Pass, for we distinctly reported it as easy of ascent and descent. I think these tales must have come from the Arguns, who were employed, and whose interest it is to exaggerate all difficulties with a view of increasing their rewards. Ever since I led the first exploring party in recent times to cross and recross the Pamirs in 1874, I have observed very closely the explorations which followed ours. The famous Skobeloff immediately replied by passing down from Khokand towards Tashkurgan, and his very able assistant, Captain of the Staff, Kuropatkin, also explored in that direction. Very shortly after that, England and Russia began to vie with one another in gaining a geographical knowledge of that then comparatively little known region, and France and Germany subsequently joined in. England has had, I should say, the biggest share in it in later times. I would mention Mr. Ney Elias, then Younghusband, assisted by Davison, then Littledale, who like the lecturer to-night, was a splendid sportsman, as well as a successful explorer. Lord Dunmore has devoted himself to working in a rather remote corner, and I have no doubt he has gained a great deal of information which may prove valuable in solving the big problem which seems to be presenting itself there for early solution. I congratulate Lord Dunmore and Major Roche upon their very successful journey.

Mr. W. M. CONWAY: The only remark that I think is called for from me, bears upon the question of the experiences of the party at high altitudes. I notice that Lord Dunmore mentions that he first experienced discomfort, not on the top of but whilst descending from a pass 18,000 feet high. They were at the time on a glacier and probably in a hollow place. That observation, I think, is of importance. It is not

new, but we have so few accurate observations about the effects of high altitudes, that it is important to get any testimony tending to show that you do not necessarily feel the worst effect of diminished air-pressure on the highest points; there are many other factors that enter into the production of that uncomfortable sensation, and one of the most important of these seems the neighbourhood of snow. It seems to me quite clear that in high places upon snow the effects of atmospheric pressure are more marked than in equally high places on rocks. Lord Dunmore observed next that they found it hard to sleep on an occasion when they were for the first time at 17,000 feet; but I gathered that on later occasions they maintained a high altitude for a considerable period and experienced no discomfort. At 18,000 feet, which they again rose to on the Depsang Plain, notwithstanding that they were helped by the wind, which is of great assistance in warding off the effect of diminished atmospheric pressure, they experienced the most marked discomfort. These observations are of importance, because they show that at heights of 17–18,000 feet, as noticed also by Captain Bower in Western Tibet, considerable discomforts were felt, whereas it seems to be the case in Sikkim that mountaineers and travellers can rise to higher altitudes almost without discomfort. Possibly the greater amount of moisture in the atmosphere of the Eastern Himalayas somewhat lessens the discomforts of diminished air-pressure, whilst in the dry atmosphere of the Pamirs and Mustagh regions greater discomfort is felt owing to the dryness.

Hon. G. N. CURZON: I should like to endorse what fell from Sir Thomas Gordon as to the great value of explorations such as Lord Dunmore has so well described to us. Just as Mrs. Bishop found an excuse for speaking in the fact that she had traversed some of the earlier parts of Lord Dunmore's journey, so I might find an excuse in the fact that I have traversed some of the later portions. I have had occasion to go very minutely into the question of the Pamirs and the Upper Oxus, and had intended, but for the disagreeable necessities of Parliamentary life, going to that region myself this summer. Now General Gordon spoke as a member of the first and last organised British expedition to the Pamirs, the last whose record has been given to the public, and although as he says, Mr. Littledale, Captain Younghusband and Lieut. Davison, and Mr. Ney Elias have been since, yet our record of exploration on the Pamirs is not equal in numbers or extent to that of Russia, who has, from year to year, sent parties, nominally scientific, really political, to those regions. Therefore we owe a debt of gratitude to gentlemen who, like Lord Dunmore, tour on their own account, and bring back to us and the Indian Government information of the highest value. The value of Lord Dunmore's travels in this case is two-fold, because, in the first place, he was on the Pamirs at an extraordinarily interesting time; but as what I am now saying touches on the forbidden ground of politics, I cannot pursue it further, but can only admire, and at a humble distance pursue the remarkable discretion in this respect that Lord Dunmore has shown. The second point on which we owe him gratitude is for the positive additions he has made to geography, to which, after all, as a Geographical Society, we attach higher value than anything else. Lord Dunmore and party passed over thirty to forty passes of great altitude under the severest conditions of atmosphere and temperature. Some of these have never been crossed before by Europeans. Further, by his discoveries, he has rectified our ideas about the peculiar chain of lakes existing in the region of the Upper Oxus. Firstly, there is the succession of small lakes, in or near to which the Oxus is said by him to rise. Then there is the cluster of lakes round Yashil Kul, on the Alichur Pamir. Finally, he has acquainted us with the fact that the lake called Rang-Kul is, in reality, two lakes, of which Rang-Kul is the smaller. These are, I think, positive additions to our geographical knowledge. There is one point on which I desire to ask a

question. Lord Dunmore, in his paper, talked about the real source of the Oxus, and on the screen showed us a fascinating picture of that river emerging from Lake Chakmak. I think in General Gordon's book, or in one of Colonel Trotter's maps, this is given as Oi Kul. Now, the river which rises in this lake, and then flows northwards, is the Aksu, which later on becomes the Murghab, and, after making a great bend to the west, rejoins the Oxus (as commonly accepted) at Kila Wamar. But there is another stream which some people insist upon regarding as the true source of the Oxus, where the upper portion of the Wakhan River, known as the Ak Bilis, rises just north of the Wakhijir Pass amid three great glaciers, which a Frenchman, M. Dauvergne, visited two or three years ago. I cannot help preferring that the Oxus should be held to rise in these great glaciers rather than in an insignificant lake; and I venture to suggest that this, and not the Aksu, the resemblance of whose name to the Oxus is purely accidental, should be regarded as the true parent stream. I have one other thing to say: Lord Dunmore's paper illustrated in an interesting manner the national traits of the various peoples scattered over this remote tableland. First, there are the Kirghiz, genuine nomads, and, I believe, almost always hospitable and generous to travellers. Then there are the Chinese, on political grounds supposed to be friendly towards us, a characteristic which they do not invariably show. Whatever their attitude towards foreigners, their political position on the Pamirs is most inefficient. I do not believe in the wonderful things the Chinese are going to do on the Pamirs. The most gratifying feature, however, to which Lord Dunmore paid a generous tribute, is the civility and courtesy of the Russians. Nobody can deny the fact that the Russians on the Pamirs are possible rivals to ourselves, and it is therefore particularly gratifying that, when a Russian officer comes in contact with an English traveller, they should meet as gentlemen and friends. Even when Captain Younghusband was turned out by the Russians from Bozai Gumbaz, nothing could exceed the politeness of the officer who turned him out. It is gratifying that these great national rivalries, which are too great to be entirely obliterated, do not interfere with the courtesies which should and do prevail, more particularly in inhospitable regions such as Lord Dunmore has visited. I trust that not merely the substance of the paper, but also the admirable illustrations from his own brush will shortly reappear in the book, which, I understand, Lord Dunmore is about to publish, and I hope the rest of this assembly will follow my own example by buying a copy the first day it appears.

Lord DUNMORE replied: In answer to the questions put to me by Mrs. Bishop, I can only say it was a cause of serious regret to me that I had not a botanist with me, as I myself know little or nothing of botany. I have noticed the ice-plants to which Mrs. Bishop refers; but only on the comparatively low passes between Gulcha and Osh in Russian Central Asia. I never saw any on the high passes in the Kuen Lun, Mustagh, or Himalayan ranges; but as most of those passes were deep in snow we were unable to see what was underneath the snow. I cannot think there is vegetation of any sort above 16,000 feet, as there is no animal life. The edelweiss I never saw at all. As to the great variation of temperatures, I regret that I have not by me to-night the meteorological observations taken by Major Roche and myself, but I can recollect variations of 85° to 90° between dawn and midday, especially on the Pamirs.

General Gordon was good enough to make some remarks. I read his book with great interest before starting on this expedition, and followed the track of the Forsyth Expedition from Leh to Yarkand. As regards the correctness of the altitudes, the General knows as well, or probably better than I do, that it is impossible to place any reliance on the reading of aneroids over 16,000 feet elevation above the sea-level; some of our instruments would vary only 50 feet at 12,000 feet,

and at 16,000 feet would vary 300 feet. We shall never know the correct altitudes of these passes until a proper trigonometrical survey is made. I had my instruments corrected on my return to India, and have in consequence deducted 320 feet off all the altitudes I took.

In reply to Mr. Conway's remarks regarding difficulty of respiration at abnormally high altitudes, I can only say that my experience coincides with his. The first time I suffered from the great rarefaction of the air was not by any means at a great altitude, only about 16,000 feet, when in trying to make a hole with a pickaxe in which to sink my tent-pole, I suddenly felt giddy and light-headed and fell flat on my face on the ground. At 19,000 feet we felt no discomfort, whereas at lower altitudes it was sometimes almost impossible to breathe if one made the slightest exertion.

Mr. Curzon has asked me some questions with regard to my determining the Oxus source at the north-east end of the Chakmak Lake and not in the Sarhad River source. My reasons for so doing are as follows : Between the source of the Sarhad and the Chakmak Lake is a very low watershed ; on the south-west side of this watershed is the source of the Sarhad River, which joins the Ak-Bilis under the walls of the Tomb of Bozai at a place called Bozai Gumbaz. Their joint waters flow to Ishkashem, whence they run north under the name of Ab-i-panj, until they reach Kala Wamar, a distance roughly measured by me as 240 miles, and receiving on the way the waters of the Pamir River which rises at the west end of Victoria Lake, and the Ghund River which runs out of the Yashil Kul. On the north-east side of this watershed is the Chakmak Lake, out of which flows the Aksu River. I believe myself that Oxus is a corruption of the old Kirghiz name of Aksu, meaning white water. This river, which we believe to be the true Oxus, flows north-east to Aktash, receiving the waters of the Beik, Chistoba and a few minor rivers. It then takes a turn west to Murghabi on the Sarez Pamir, and receiving the waters of the Ak-Baital runs past Colonel Yonoff's headquarters, where it becomes the Murghab River ; thence west until it becomes the Bartang, and so on to Kala Wamar, a distance from its source of 252 miles. This Aksu is therefore 12 miles longer and with a greater volume of water than the Sarhad. Mr. Curzon made mention of the Kirghiz and Chinese. I lived amongst the former for six months, and a quieter or more honest set of people I never met. As to the Chinese troops I could not judge about them, as they had but twelve men on the Pamirs in 1892.

General STRACHEY : It only remains for me now to return thanks to Lord Dunmore for the extremely interesting paper he has read to us.

THE MAP TO LORD DUNMORE'S PAPER.—The map which accompanies Lord Dunmore's paper is taken from Johnston's "Royal Atlas," and is intended only to show his route. A few corrections have been made, but the map does not contain the most recent additions to our knowledge of the Pamirs. The information brought home by Lord Dunmore, together with the work of other recent explorers, Russian and English, will be embodied in a map which is in preparation in the Society's offices. Reference may also be made to the map of the Pamirs accompanying Captain Younghusband's paper, *Proceedings R.G.S.* Vol. XIV., p. 272.

ROUTES AND DISTRICTS IN SOUTHERN NYASALAND.*

By Lieut. B. L. SCLATER, R.E.

DURING the two years which I have just passed in the new Protectorate of British Central Africa, as assistant to Mr. H. H. Johnston, C.B., H.B.M. Commissioner, I have been much pressed with official work of all kinds, as was quite to be expected in the case of instituting an entirely new government for a territory larger than France, and have not been able to accomplish so much geographical work as I could have wished. Nevertheless I trust that some information that I have been able to put together concerning the principal routes and districts in the Shire Highlands or Southern Nyasaland, as is the official name of the district immediately south of Lake Nyasa, may not be unacceptable to the readers of *The Geographical Journal*, and be of some use to visitors to British Central Africa. I will take these routes and districts in the following order:—

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| I.—From Chinde to Chiromo. | IX.—From Chiromo to Milanji. |
| II.—The District of Chiromo. | X.—From Milanji to Zomba. |
| III.—From Chiromo to Chikwawa. | XI.—The Zomba District. |
| IV.—The West Shire District. | XII.—From Zomba to Mpimbi. |
| V.—From Chikwawa to Blantyre. | XIII.—The Upper Shire District. |
| VI.—The Blantyre District. | XIV.—From Mpimbi to Fort Johnston. |
| VII.—From Blantyre to Milanji. | XV.—The South Nyasa District. |
| VIII.—The Milanji District. | |

I.—FROM CHINDE TO CHIROMO.

The best point from which to reach British Central Africa is the lately opened Port of Chinde, situated at the Chinde mouth of the Zambesi. There is now regular communication with this port by coasting steamers every month from Mozambique, in connection with the German East African Line, and every six weeks from Durban, by the Union Line. Moreover, Messrs. Rennie run a steamer from Durban to Chinde in connection with their direct "Aberdeen Line" from London to Port Natal.

At Chinde, in accordance with our treaty with the Portuguese Government, a block of land with a frontage of 400 metres has been leased to the British Central African Administration, to form a bonded warehouse under British management. Here goods can be landed free from Portuguese duties for transport up the Zambesi to British territory. The British Central African Administration have an agent in charge of the Concession, and the chief firms trading in British Central Africa have

* Map, p. 480.

established stores and offices here. The Concession lies about a mile above the entrance to the river on the right bank, *i.e.* to the left on going up. The Portuguese town of Chinde, which is to the east of it, has been laid out in plots, many of which are taken up for building. There are several European firms trading here and a number of stores kept by Banyans. Chinde is in telegraphic communication with Kiliman *via* Sombo, and so with Chiromo and Sena, the main line to these stations starting from Kiliman. Unfortunately the line is not well maintained, and messages often take two or three days and even a fortnight to reach Chiromo from Chinde.

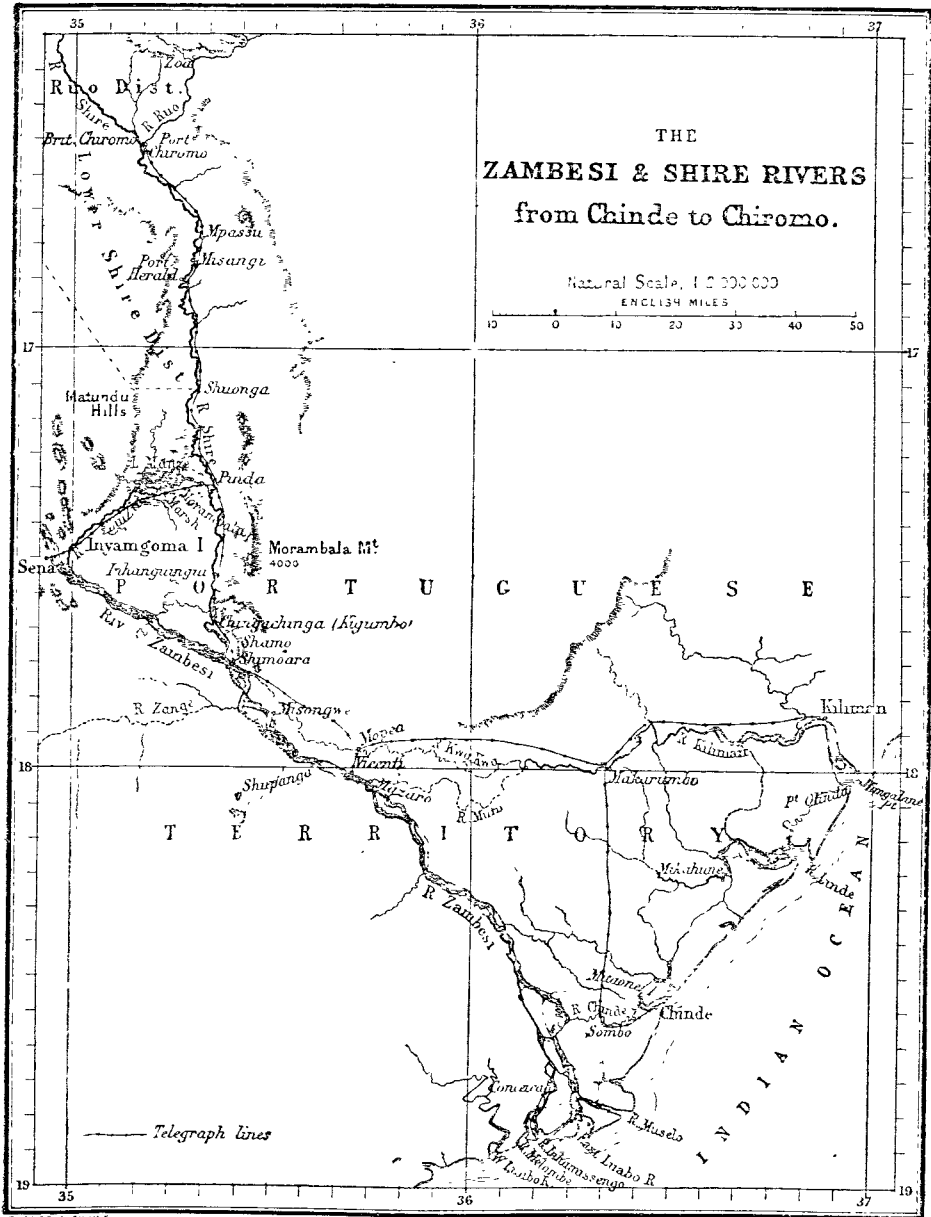
Chinde is fairly healthy, as it is built on a sand-spit, and gets a fresh sea-breeze at the back. There is also a good supply of small timber for building, and abundance of fuel close at hand.

From Chinde the voyage up the Zambesi and Shire to Chiromo can be made either in steamers or in boats. The steamers take from six to eight days. When the river is high there is as much as 6 feet of water up to Chiromo, but from the end of July till November, when the river is low, 2 feet is the maximum depth of water in some places. In boats or canoes the journey takes from fifteen days, in the dry season, to a month in the wet. This is owing to the current being less in the dry season and the river being so shallow as to allow of the use of poles.

In June 1890, when I joined Mr. Johnston at Chinde, I made my first journey up the river in boats and canoes, and since then I have made the passage in steamers.

The River Chinde at the mouth is a fine broad stream, over a mile wide and from 30 to 40 feet deep. The ocean steamers can lie within 20 yards of the shore off the British Concession. About 3 miles up, the Chinde narrows suddenly to a creek about 100 yards in width, and is nearly of the same width up to the point where it issues from the main Zambesi, a distance of about 20 miles. About 12 miles from Chinde the Portuguese station of Sombo is passed. Here the Portuguese have a small dockyard for the repair of their river-gunboats, and some workshops with steam-saws and turning-lathes. They are also building a slip. Here also a Portuguese settler has a fine brick-house and plantation of some three hundred thousand coco-nut trees. Some of the latter are just coming into bearing, and the plantation, if well cared for, will ultimately, no doubt, form a source of great profit. From this point up to the junction with the Zambesi, are occasionally seen a few huts and gardens of the natives. When the main Zambesi is reached the ebb-tide will be found to be very strong, and it is almost impossible to paddle against it, but the flood-tide will carry up nearly another 20 miles in the dry season. Last March the Zambesi was so high that the current at Chinde, during the first three days I was there, was constantly running out. For many miles, after the Zambesi is entered, the banks are low and the country on both sides is swampy and with few trees. The

river is from 1 to 3 miles wide, and the numerous sand-banks and islands, which are constantly shifting, make navigation difficult; but



there is always a channel even in the dryest season, with from 3 to 4 feet of water, up to Vicenti.

Vicenti is an old Portuguese settlement on the north bank of the river, and is the place at which goods arriving from Kiliman by the Kwakwa were formerly shipped on the Zambesi. Mopea, the head of the navigation of the Kwakwa, is about 3 miles to the north of Vicenti. The goods were brought up the Kwakwa in canoes, and carried across to Vicenti by land. The African Lakes Company had a station here formerly, but it is closed, and all their transport work is now done direct from Chinde.

The Portuguese have a naval station at Vicenti, and there are one or two stores here. The Portuguese military commander lives at Mopea, where there is a telegraph-station on the main-line to Chiromo, while a branch-line connects it with Vicenti.

From Vicenti to the confluence of the Shire, a distance of about 30 miles, the channel of the Zambesi, in the dry season, is very winding, and it is sometimes difficult to navigate a boat drawing more than 2 feet of water. After leaving Vicenti the route usually used crosses the river to the right bank and passes close to Shupanga, where the Mozambique Company have recently established a station and custom-house, and then crosses back again to Masongwe on the left bank, about 10 miles above Vicenti. Here are a number of stores kept by Banyans and a few European traders, who generally have a supply of wood ready for passing steamers. The channel at the mouth of the Shire is rather deeper, but for the first few miles after entering the Shire it is somewhat difficult to find, as in some places the river broadens out and leaves sand-flats, on which the water is sometimes as little as 2 feet 6 inches. But after this the river deepens, and then as far as Pinda, passing the splendid mountain of Morambala, which rises to a height of 4000 feet above the sea-level, close to the left bank, there are no serious difficulties.

The Portuguese have a station at the foot of the Morambala Mountain under a military commandant. Here wood can be obtained, and provisions can usually be procured from the few scattered villages on both banks of the river.

Pinda is the outlet of the Morambala marsh, which in the wet season is almost a lake, but in the dry season is a swamp, traversed by the river in a number of deep narrow channels. Last year the usual course of the Shire at the exit from the Morambala marsh became blocked up with sand, and a new channel was formed through which the current flowed with such force that it was almost impossible to get the steamers up. It was in consequence found necessary to unload all goods going up the river, and to re-ship them above the obstruction.

At Pinda the branch telegraph from Sena joins the main line, and there is a telegraph office.

From Pinda, after passing the Morambala Marsh to Port Herald, there is an excellent but narrow channel. At Shuonga, on the left

bank, is a Portuguese custom-house, opposite which, on the right bank, is a notice-board, stating that this spot is the commencement of British territory. From this point, which is in lat. $17^{\circ} 5' 30''$, the boundary line of British Central Africa runs due west to the water-parting of the Zambesi and Shire Rivers, and thence follows that water-parting to lat. 14° S. Shortly before reaching Port Herald are passed what have been aptly named the "S" bends, in which the curves are so sharp that it is almost impossible to get a steamer through without touching one bank or the other.

Port Herald, the first British station on the Shire, is situated on the right bank of the river about 30 miles below Chiromo. It is the chief station of the Lower Shire District, which includes all the British territory on the right bank of the Shire, below a line drawn due west from Chiromo. Here the Shire is bordered by a plain, which diminishes from 20 miles in width opposite Chiromo, to about 3 miles at Port Herald. Below Port Herald the plain widens out again, and forms the Morambala Marsh. In the Lower Shire District the northern slopes of the Matundu Hills are also included. These hills rise to about 2000 feet above the sea-level, and are the source of a number of small streams which dry up when they reach the plain above-mentioned. It is said that beds of coal are found in these hills, but up to the present time they have not been located, and there is considerable doubt as to their existence. Mr. Simpson, who has a station on the right bank of the river at Misangi about 6 miles above Port Herald, has a coffee plantation, which is said to be doing well on the upper slopes of these mountains. On the lower slopes and in the valleys and on portions of the plain there is a fine supply of timber suitable for boats and for house-building.

Above Mr. Simpson's station at Misangi the river becomes rather shallow, and for a month or two during the last dry season, steamers drawing more than 2 feet of water have had great difficulty in getting past. But as a rule, in the dry season, the water in the main channel is from 2 feet 6 inches to 3 feet, and in the wet season as much as 7 or 8 feet in depth.

II. THE DISTRICT OF CHIROMO.

Chiromo lies in the fork at the confluence of the Ruo and the Shire. The Shire here is about 70 or 80 yards broad, with a current of from 2 to 4 miles an hour, varying according to the season. The Ruo forms an estuary nearly 200 yards wide for the last mile before it reaches the Shire. On the left bank of the Ruo lies Portuguese Chiromo, where there are a military commandant and soldiers and a few trading stores. It is also the terminus of the telegraph-line from Kiliman.

At British Chiromo is the custom-house, where goods are cleared for British Central Africa. The ground has been laid out in streets and

plots, but as yet not many of them are taken up. As, however, trade increases, Chiromo must, from its position, become an important town. It is the nearest port for the Cholo and Milanji districts, where there are already a number of coffee-plantations. The native population in the neighbourhood is also considerable, and their wants will increase no doubt with the growth of civilisation.

Chiromo is the chief station of the "Ruo District." This district includes the country on the left bank of the Shire from the Maparara to the Ruo, and stretches back to the Luchenza and Tochila Rivers. On the right bank it embraces all the country up to the water-parting opposite the above-mentioned affluents of the Shire.

This country was formerly in the hands of Chipatula, a Makololo of Livingstone's Expedition, but is now under the sway of his two grandsons, MBengwa and Makwera, who govern it under the direction of the collector at Chiromo. There is, however, a small strip of country bordering the Ruo opposite, and below the Zoa Falls, under a chief Mlolo, who had lately (in 1890) moved over from the Portuguese side of the river. The district consists for the most part of the Elephant Marsh and the plains surrounding it. It also includes in the south the hills up to the water-parting of the Shire and Zambesi, of which little is known, and in the north the greater portions of the Cholo mountains and plateau. The Cholo Range forms the watershed between the Mpansi and Shire, and the Tochila and the Ruo, and forms a fine plateau, about 40 miles long and from 10 to 15 miles broad, with an elevation of from 2500 to 3500 feet. It is well watered by a number of perennial streams, and in many places the soil is excellent and suitable for coffee plantations. The plateau is not very thickly populated, there being but few villages and these generally small; the greater part of it is covered with forest, especially on the northern slopes towards the Tochila. The highest point, Mount Cholo, is a wooded knoll, rising from 200 to 300 feet above the surrounding plateau to a height of perhaps 4000 feet above sea-level. In places the valleys are most beautiful, the *Raphia* palm and various kinds of tree-ferns growing in and along the banks of the streams. Other places are covered with dense virgin forest, and furnish magnificent specimens of Mbela-trees, with straight stems running up to 60 feet and more, and measuring from 4 to 5 feet in diameter throughout, from which the native canoes are made.

Owing to its proximity to the river, the distance being only from 10 to 25 miles, this plateau will undoubtedly be soon taken up by planters. The rainfall here is said to be rather greater than in the Blantyre District. If this is the case its value as a planting district will be materially increased, but no definite measurements of the rainfall have as yet been taken. In October 1891 I travelled across the Cholo Plateau district from Zoa to Blantyre. Unfortunately I was

not in a good state of health at the time, and was unable to make any detailed survey of the route that I followed. After reaching the confluence of the Ruo and Tochila, I struck up the valley of the latter and followed it up to its confluence with the Swadzi.

The Swadzi flows through a deep rocky, but well-timbered, valley, with patches of excellent land along its course. After passing about 5 miles up the right bank of the Swadzi, the path crosses the river and ascends the hills to the north. I passed about 3 or 4 miles to the north of the wooded knoll which forms the highest point of the Cholo Range, and then followed the water-parting between the Mpansi and Tochila. Mr. Sharrer has cleared a road along this ridge from his Cholo plantations into Blantyre.

III.—FROM CHIROMO TO CHIKWAWA.

From Chiromo to Chikwawa, a distance of 45 miles as the crow flies, and about 70 miles by the river, a boat or canoe takes from three to five days to ascend, and from a day to a day and a half to descend. Steamers and lighters drawing more than 15 inches of water cannot get up in the dry season (from July till December); in the wet season, however, there is a depth of from 3 to 4 feet of water.

For the first few miles above Chiromo the river is broad, and in the dry season there are several dangerous sandbanks. For the next 20 miles the Shire flows through the Elephant Marsh, and is split up into several narrow and deep channels. The natives from the surrounding villages raise splendid crops of maize on the islands in the marsh, and also a little rice. The whole marsh is specially suitable for rice cultivation. Above the marsh the river passes through fine belts of palm-trees. About 50 miles above Chiromo, on the left bank, lies Makwera's village, where there is a considerable population. Makwera has three coconut-palms in his village which bear nuts every year; he has also a fair number of sheep and large herds of goats. This chief was for a short time at the mission at Blantyre; he can read and write his own language, and corresponds with the collector at Chiromo on the affairs of his district. About 10 miles higher up is the village of Masea, on the right bank, but before reaching this the confluence of the Maparara on the left bank is passed. This river forms the boundary between the West Shire District and Makwera's country. Mr. Sharrer has a station here from which he supplies his plantations on the Cholo Plateau. On the right bank before reaching Masea's the confluence of the Mwanza and Shire is passed, but I have never been able to locate this point exactly, owing to the numerous islands in the main channel of this river.

Masea is one of the Makololos left in the country by Livingstone. His chief remembrances of Livingstone are connected with the steam-

launch *Ma Robert*, of which he was stoker, and with a trip he made in her to the Johanna Islands. Masea is now the most important of the Makololo chiefs. His country, which is in the "West Shire District," lies on either side of the Shire, on the left bank between the Mpansi and Maparara streams, running back to the hills, and on the right bank extending across the Mwanza Valley to the water-parting between the Zambesi and Shire. Both on the Shire and the Mwanza the country is fairly thickly populated. At a spot about a day's journey west by south-west from Masea's, there are some salt-pans from which large quantities of salt are obtained. Opposite Masea's village, on the left bank, the Blantyre Mission have lately opened a station in connection with their steamer on the river.

About 5 miles further up on the left bank is the station of the African Lakes Company and the village of Katunga. There is also a station of Mr. Sharrer's here.

The African Lakes Company's steamers land their cargo for Blantyre at Katunga. The Government station is at Chikwawa, about 2 miles further up on the same bank, where Mr. Buchanan has a plantation.

IV. THE WEST SHIRE DISTRICT.

Chikwawa is the headquarters of the officer in charge of the West Shire District, and also the station where goods are landed for Blantyre. The district lies on both sides of the river. On the north it is bounded by the Mukurumadzi River, on the west by the water-parting of the Shire and Zambesi, and on the south by a line drawn from the confluence of the Mwanza and Shire to the water-parting. On the east of the Shire this district extends to the edge of the high plateau from opposite the confluence of the Mukurumadzi and Shire to the Maparara stream.

The West Shire District has a general elevation of from 800 to 2000 feet above the sea-level. On both sides of the river are very fertile plains, and the Valley of Mwanza is wonderfully rich, and is thickly populated. The country between the Shire and Mwanza, which consists of a series of low ridges of hills, is absolutely waterless in the dry season, and the district to the south of the Mwanza is of a similar nature. At the same time the soil is fertile, and in the wet season the natives penetrate into the interior considerable distances from the river, and make gardens, which bear heavy crops of kaffir-corn. These crops are reaped at the end of the wet season, and the gardens are then deserted for the rest of the year.

Last September I made a journey across this country to an important village called Mikolongo, where the Central African Company have a station. I started in a canoe up the Shire from Chikwawa. The Shire is easily navigable for steamers 4 miles above Chikwawa, up to the

confluence of the Likabula. Just above this point a ridge of rocks runs across the bed of the Shire, and caused slight rapids. The fall is not very great, even in the dry season, and it is always possible to get canoes and small boats up the rapids by poling. In the wet season steamers can pass. Above these rapids the river is quiet, though rather shallow in places in the dry season. Chirala, the village of Mbula, is about 6 miles above the rapids on the left bank. Here I learnt that the next rapids do not occur for nearly a day's journey (about 12 miles), up to which point one can travel in a canoe; but, much to my regret, I could not spare time to visit them.

Chirala is a large village, and there is a considerable population. Probably there are over two thousand people in this and the surrounding villages. Mbula has a small herd of cattle, but they do not seem to flourish, possibly from neglect, as there does not appear to be any tsetse fly in this district. Goats and sheep are fairly abundant.

On leaving Chirala I crossed the river, and marched about 4 miles up the right bank to Nchuali, the village of Mlauri.

Mlauri was formerly head chief of the Makololo, in succession to Ramakukan, but was deposed after his defeat by the Portuguese expedition under Serpa Pinto. He is still, however, held in considerable respect, and is consulted in all important matters of state by the young chief of Chirala. He is very intelligent, and a fine-looking old man, and was much pleased to have a talk about Livingstone and his former journeys with the great traveller.

From Nchuali I marched about 5 miles west, to a small village called Manchombi, where there was a well in the bed of a dry stream. All the intervening country was extremely arid, and covered with scrubby forest. We had a 20-mile march before us from this place to the Mwanza, with absolutely no water on it, so we started at 3 a.m. to avoid the heat of the day. We reached the Mwanza at a village called Bengera about 11 a.m. From here I went on by Nyamuka to Mikolongo, where I stayed a day with M. Foa, an agent of the Central African Company. Mikolongo is a large village of nearly two hundred huts, and lies on the right bank of the Mwanza just below its confluence with the Gombedzi River. The Mwanza is here a considerable stream even in the driest season; it is from 12 to 15 feet wide, and from 1 foot to 9 inches deep, with a current of from 4 to 5 miles an hour. In the wet season it is a very large river. From Mikolongo I followed the river down the right bank to Katawala, where I crossed to the left bank. Between these places the river-bed is from half a mile to a mile wide, and lies between banks about 20 feet high on either side. Below Katawala the river-valley widens out into marsh, which, I believe, eventually joins the Elephant Marsh of the Shire.

In the bed of the river and in the marsh rice is extensively cultivated, while Indian corn is planted by the natives every fortnight, so

that they may always have the luxury of green corn. Kaffir corn is grown during the wet season on the banks on both sides. The population on the Mwanza is thick for Africa. I myself saw more than fifteen villages in the 10 miles between Mikolongo and Katawala, and I counted nearly one thousand houses in them, besides hearing of many others which I did not visit. The people are of a lazy and less prosperous type than those on the Shire. Their country is so fertile that they live with greater ease, and they have learnt from the Portuguese half-castes the art of distilling ardent spirits, in which they indulge considerably. It is extremely difficult to get men either to work or to carry loads. Game is very abundant in the hills on both sides of the Mwanza. Water-buck, eland and hartebeest are especially plentiful. On the hills to the south is found the Bō Antelope (*Trogelaphus angasi*) in considerable numbers. Zebras, buffaloes, koodoos and bush-bucks, are also plentiful; and rhinoceroses and elephants are occasionally met with.

From Katawala after crossing the river I kept along the left bank of the marsh for some distance, passing through several villages, and then struck across the low hills direct to the Shire, which I reached opposite Mulilima's village.

Owing to its low elevation the West Shire district is not adapted for European habitation, but it is well-suited for raising tropical products, such as rice, oil-seeds, cotton, Indian and Kaffir corn, indigo and opium. The first five of these products are already plentiful, and doing extremely well. In the opinion of men who have been engaged in the indigo and opium industries in India this district is especially well suited for them. Sugar and tobacco also flourish, and might likewise prove worth development commercially, as soon as cheaper transport is instituted.

V. FROM CHIKWAWA TO BLANTYRE.

This is a route well known and has often been described. A road was first made between these places by the combined Scotch and Free Church Missions, under the direction of Mr. Henderson, C.E. This road has been altered by the African Lakes Company at various times, but it has never really been fit for wheeled traffic. The total rise is about 3000 feet in 26 miles, but as Mbami is about the same height as Blantyre this makes the rise 3000 feet in the first 14 miles. The most difficult places on the road are the first rise from the plain up to Makoka, and the second rise at the edge of the plateau up to Mbami. Here in making the road suitable for wheeled traffic it has been found necessary to introduce zigzags, and by these means I was able to secure a maximum gradient of 1 in 15. The road follows the water-parting of the Mpansi and Likabula Rivers nearly the whole distance, and thus has not involved much heavy work except on the above-mentioned hills. In forming the

cuttings on the Mbazo hill below Mbami, a few good sections were made showing the geological formation of this part of the country to be sandstone. The sandstone is of a white, hard, crystalline sort, metamorphosed and almost quartzite in places; no intrusive dykes were observed, although I should say they must exist. The surface of the hill is covered with immense quantities of *débris*, consisting of sand and clay mixed with round boulders of blue basalt, which vary in size from pebbles up to blocks of many tons in weight. I could find no traces of glacial action. Mr. Boyd, who was employed looking after the working parties, had had considerable experience in mining in other countries, and although he reported that the formation looked most favourable for minerals, he was unable to find traces of gold or any other ores either *in situ* or by washing in the surrounding streams.

VI. THE BLANTYRE DISTRICT.

This is at present the most highly developed district of the Shire Highlands. Blantyre is the headquarters of the Church of Scotland Mission, of the "African Lakes Company," of Mr. Sharrer and of several other traders and planters. Mr. Buchanan has plantations at Michiru Lunzu and Mbami. Altogether there are eighteen plantations here belonging to ten different owners with a total acreage of 1300 acres.

Mr. Buchanan also grows and manufactures tobacco and cigars for local consumption. Tea and cinchona are being tried and grow well, but have not yet been cultivated in sufficient quantities to be commercially valuable.

The Blantyre district lies almost entirely on the plateau, but stretches down to the river opposite the Murchison Cataracts and up to Matope. As a whole the soil is not so fertile as in the Cholo district, and the rainfall appears to be a little less; it averages about 50 inches in the year.

There is a considerable native population around Blantyre, chiefly Yaos. The country was formerly owned by three chiefs, Kapeni, Chintengi and Chejoi: the last two are now dead and are represented by men who have practically lost all power. Large portions of the land are now in the hands of Europeans, having been bought from the above chiefs for planting purposes. To the north-west of Blantyre near the Shire is a range of limestone hills, whence lime is procured for building at Blantyre. I never had an opportunity of visiting this place. The limestone is brought in by the natives: it is a hard, pure, white crystalline marble burning to a fat white lime, which forms fair mortar and excellent whitewash. At Mount Mpingwi to the east there are deposits of white china clay, which is also brought to Blantyre by the natives, and is used for whitewash.

VII.—FROM BLANTYRE TO MILANJI.

This is a distance of about 50 miles, and the journey takes from two to three days according to what part of the district it is required to reach. Leaving Blantyre the path follows an east-south-east direction, and after crossing several streams of the Mudi and passing a flourishing coffee-plantation of Mr. Duncan's, reaches at a distance of about 4 miles Mr. Lindsay's plantation, which lies on the water-shed between the Tochila and Mpansi. It then crosses the Luchenza and passes between the mountains Bangwi and Malabvi.

On the north slopes of Malabvi there is a large scattered village, and the inhabitants have large gardens. After crossing the Chombezi the path keeps on through broken country to Midima, a small village which lies on the northern slopes of the hill of that name. This village is 20 miles from Blantyre, and is the usual half-way house. From Midima to Milanji the path crossed the Tochila plain, which is almost flat, and lies at a height of 2000 feet above sea-level. Twelve miles from Midima the Tochila is reached. The river flows between banks about 20 feet high and from 100 to 150 yards apart. In the dry season it is easily passable in most places, but after rain it rises to from 10 to 15 feet, and becomes an impassable torrent. Dr. Scott, of the Blantyre Mission, has built a light timber bridge over it for foot traffic, which is a great convenience in the wet season, but a new bridge will have to be constructed when the road is completed from Blantyre to Milanji. This road is now being constructed to take wheeled traffic by Mr. John Moir, who has undertaken the contract for the British Central Africa Administration. From the Tochila to Milanji the path continues over the plain until it descends into the valley of the Likabula River, which it crosses by another wooden bridge. After this one path ascends the lower slopes of the Milanji Mountain to the Mission station, while another continues southwards along the foot of the slopes to the station of the British Central Africa Administration beyond Chipoka's, a distance of about 10 miles.

VIII.—THE MILANJI DISTRICT.

This is the most easterly district in the British territory. It lies all around the great mountain Milanji, extending to the south as far as the Ruo and Tochila Rivers, and to the north up to Lake Shirwa. The country round the base of the mountain is a fairly level plain, of an elevation of about 2000 feet above the sea. From the plain the country gradually rises towards the mountain to a height of about 3000 feet, forming the lower spurs, and from this foundation the mountain rises another 3000 feet in abrupt cliffs, only broken in the places where the larger streams flow down. This rampart of cliffs borders the upper

plateau of Milanji, about 6000 feet above the sea-level, which is of considerable extent, though split up into various portions by deep ravines and precipices. In the centre of this plateau the peaks rise another 3300 feet, making a total height of 9300 feet.

The plain around the base of Milanji to the south and east is broken and hilly, being abundantly watered by perennial streams from the mountain. It is extremely fertile, and the forest is the finest I have seen in this part of Africa. The rainfall is apparently heavier in this district than in any other place in the Shire Highlands.* There is rain throughout the year and a month never passes without a few showers. In the wet season rain is heavy and constant. Several plantations have been started, and the coffee-plant appears to flourish, but as yet has not reached maturity, so it is impossible to say what the crop will be.

Towards the west the plateau is dry and poorly forested, with open grass plains in some parts. In certain places game of all kinds swarms, especially around the marsh formed by the Tochila stream. The lower slopes of the mountain here are fairly well watered, and land has been taken up in two or three spots to start coffee-plantations. But the rainfall is not nearly so heavy as at the east end of the mountain, and for several months in the dry season there is no rain, as is the case in other parts of the Highlands.

The northern slopes are equally well watered and fertile, the natives raising large crops. In November 1891, when I came to Milanji from Zomba, there was a severe famine, both at Zomba and Blantyre, owing to the short crop that year.† Yet at Milanji food was fairly plentiful, as owing to the more constant rainfall the new crops were already nearly ripe, and in some few places were actually being gathered.

All the lower slopes of the mountain are suitable for coffee, and as the present population is not very large or very industrious there is ample room for plantations. To the south as far as the Tochila and Ruu are areas of splendid forest-land suitable for coffee and other tropical products, and I have no doubt that Milanji will eventually become a most thriving coffee-planting centre and one of the most prosperous agricultural districts in British Central Africa.

The population around the mountain consists of Yaos, Manganja and Alolo. Mabuka in the south is now the Manganja chief in the place of the late Chipoka. To the west are Chingomanji, Namonde, MKanda, and Kada, all Yaos; to the north are Nazerara and Bonga, both Alolo, while to the east are Kuntiramanja and Matapwiri, Yaos again. On the upper plateau there is no permanent population, but the

* Since returning, I have heard from a planter that the rainfall for the year ending June 1893 was 80 inches.

† The natives never plant more than they expect to eat themselves, so that if there is a partial failure there is sure to be a famine.

Manganja go up there in the dry season to procure salt from the "Everlastings," which grow there in great profusion. They make the salt by burning the plants and washing the ashes. They then evaporate the water from the brine by boiling it in pots. Salt is also made in this fashion in the Shirwa plains, where certain reeds contain large quantities of salt.

From the lower spurs of Milanji to the upper plateau there are several routes. The easiest is one from the Administration Station round the south-east corner of the mountain and up a side valley of the Luchenia River.

In November 1891, when I visited the plateau, I ascended by this route. From the Administration Station the path ascends the first 1500 feet by grass-covered spurs, passing at first numerous native huts and gardens. At about 4000 feet above the sea-level it enters a band of forest, which at this spot hangs on the upper slopes of the mountain. On the south face the cliffs are almost perpendicular and show a surface of bare rock. The path ascends about 1000 feet through this forest, crossing numerous streams. The vegetation is most luxuriant; tree-ferns and creepers abound, many of the latter belonging to species which produce india-rubber. From the forest the path emerges into a more open valley varied with dense thickets of bamboos and underwood; up this it gradually winds, the vegetation becoming less and less, till it changes to open grass with patches of bracken, and finally reaches the edge of the plateau. Here a splendid scene lies before the spectator; at his feet are rolling grass hills interspersed with patches of forest which show where the streams rise, in front, at about 2 miles distance, the valley of the Luchenia stream, which leaves the plateau through a splendid wooded gorge on the right. Beyond it rises the magnificent forest of cedars (*Widdringtonia whytei*) placed on the lower slopes of the peaks, which tower up another 3000 feet in front of him. This portion of the plateau has an area of about 10 miles by 5, and in it rise the streams which make up the Luchenia, a most important tributary of the Ruu. These rise on the western half of the plateau; some of them join together and form the main stream of the Luchenia which flows to the east, while others flow direct over the edge of the plateau, and forming splendid water-falls join the main stream on the plain below. The Ruu rises in an independent plateau to the east of the main peak, which has not as yet been visited by any European, and the Tochila and Likabula rise on similar plateaus to the north-west, divided from the main plateau and from each other by rocky spurs, which run out from the western slopes of the peak.

The Milanji plateau has been compared to Newera Eliya in Ceylon and other similar health-resorts in India. The climate is delightful; the atmosphere being fresh and bracing, and most refreshing after the hotter atmosphere of the plains below. As soon as the road has been

completed it is intended to build a sanatorium here, and the Blantyre Mission and several private individuals have already taken up blocks of land for this purpose. The British Central Africa Administration are taking measures to protect the forests, especially the cedars, which have suffered much from fires, and it is hoped that they will form a valuable supply of timber for the use of the country, if properly preserved and replanted.

As this plateau is the highest ground in this part of Africa available for a station, I have no doubt that as soon as communication is established it will become an important health-resort for all the surrounding districts.

A contract has been made by the Administration with a local planter for the construction of a road from the Administration Station to the Upper Plateau. This road is to be 8 feet wide with a maximum gradient of 1 in 6, and will be available for donkeys and light carts. A saw-mill is also being constructed on the plateau, to supply the excellent soft-wood timber which is so much required in the surrounding districts. As already stated, communication with Blantyre is also being opened, and a road to Chiromo by the Zoa Falls is in course of construction.

IX.—CHIROMO TO MILANJI.

This route will eventually be one of great importance, as it is the easiest road by which Zomba and Milanji can be reached from the Lower Shire. The Ruvo forms a break in the edge of the plateau, up which a railway could be made with fairly easy gradients. From Chiromo to Gandi, a distance of about 6 miles, the road is perfectly level, passing through well-timbered country along the right bank of the Ruvo, across the alluvial plain of the Shire River. At Gandi the lower edges of the hills are reached, and up to this point the Ruvo is navigable for light canoes, but from here to its source there is a succession of pools, rapids and waterfalls. From Gandi to Mlolo's, a distance of 7 miles, the road passes along the foot of the hills which gradually rise in height. The path cuts off bends of the river in places, and crosses a number of dry water-courses. This portion of the route could easily be made suitable for waggon traffic. Mlolo's is a considerable village with extensive gardens, in the bed of the river, and along the bottom of the valley on the right bank. Above Mlolo's to Zoa the river flows in a deep valley with steep slopes on either side, covered with bamboos and fine forest. The old path led along this valley and was extremely difficult, being impassable when the river was in flood. A new path has been opened direct from Mlolo's to Zoa, cutting off the bend of the river, and the road, when made, will follow this route. The path crosses several streams and ridges, but is considerably easier than the old one, and is at present

suitable for pack donkeys, though a few bridges would greatly improve it. At Zoa a small portion of the road has been constructed, but its continuance has been stopped for the present, owing to the impossibility of getting sufficient labour to carry on this and the Chikwawa-Blantyre road at the same time. The Ruu at Zoa falls about 150 feet, 100 feet of which is a single fall from a ledge of rock into a deep chasm. I have only seen these falls in the dry season, but even then they are a fine sight, and in the wet season they must be splendid. Above the falls the river is from 50 to 100 yards wide, and its bed is full of rocks and islands. The falls are caused by a basalt dyke which runs directly across the bed of the river. In the dry season the water flows chiefly in a narrow channel in the centre of the dyke, and after falling down about 50 feet in broken streams, collects itself and makes a final plunge into a narrow chasm of fully 100 feet. Below the chasm opens out into a glen with steep sides, clothed with fine forest. The river flows out of the chasm into a sandy pool, where a crocodile or two may generally be seen on the sand. It then flows down the glen filling up almost the entire bottom, and in the wet season rising considerably up its sides. Hippopotamuses in considerable numbers frequent the pools along the river, both above and below the falls. There is a fine supply of timber on the hills near Zoa, and all along the river valley between Zoa and Mlolo's.

Just above Zoa Mr. Buchanan is trying the experiment of a coffee-plantation to see if the coffee will flourish at so low a level as 1500 feet. It has been started rather more than a year now, and the plants look extremely flourishing. While the hills behind Zoa are rather stony and the soil poor, near the Ruu and in some of the valleys of its affluents the ground is extremely rich, and this would be a very suitable locality in which to try an experimental plantation of cocoa.

From Zoa to the confluence of the Ruu and Tochila the road will follow the river bank. In a few places a little construction and perhaps even blasting will be necessary, but as a rule the valley is open, and a road could be carried along it without much expense. Above this the valley of the Ruu becomes still more open, and a few miles after crossing the Tochila a road could easily be made in any direction required. The present path leaves the Ruu and makes a bee-line for Chipoka's, crossing the Likabula just below its confluence with the Mlodza, and so on to the Administration Station of Milanji.

X.—MILANJI TO ZOMBA.

At present there is no direct road or path between Milanji and Zomba. The usual route is round the east end of Milanji by Mount Cheza and Machenba Hill to Nazerara's, across the plain to the Likangala, and up the valley of that river and the Mlungusi to the Residency, which lies on

the right bank of the latter stream at the foot of the mountain. Another route is to follow the Blantyre road to Midima and go thence to Chiradzulu where the Blantyre-Zomba road is joined. A road could easily be made direct. In November 1891 I travelled from Zomba to Milanji, making a straight line from the Residency to the south-west corner of Milanji, and although we had some difficulty in places owing to the thick jungle, there would be absolutely no difficulty in making a road on this line.

As the country develops Mr. Johnston intends to open a direct road from Chiromo to Zomba, which, after following the Ruu up to its confluence with the Tochila, will strike straight across to the point where the Blantyre-Milanji road crosses the Tochila. From this point it will run direct to Zomba, and will thus form a fairly direct route from Zomba to Milanji, as well as from Zomba to Chiromo.

XI.—THE ZOMBA DISTRICT.

This district consists of the Zomba Range and the country to the east and south as far as Lake Shirwa and the Palombe and Mombezi rivers, and includes Chiradzulu.

The chief population is settled on the slopes of Zomba and Chiradzulu and the plain towards Shirwa, the plateau between the above-mentioned mountains being uninhabited. The chiefs and majority of the people here are Yaos, but there is a remnant of Manganjas, to whom the country formerly belonged, held in servitude. On Zomba the chiefs are Kowinga, Milemya, and Chemlumbi, and on Chiradzulu, Kumpama.

The Residency of Zomba, the headquarters of the British Central Africa Administration, lies on the south-east slopes of Mount Zomba, close to the Mlungusi stream, and, therefore, in the watershed of Lake Shirwa, at a height of 2970 feet above the sea-level. Mr. Whyte, the scientific officer of the Administration, has his headquarters here, and carries on experiments in economic botany in the garden and surrounding grounds. He has successfully cultivated all the common European vegetables, and has planted avenues of many varieties of conifers, and other useful and ornamental trees, which are in a most flourishing condition.

At present coffee has been tried only on the south-eastern and southern slopes of Zomba, and although the plant grows well it sometimes suffers severely from the hot winds which blow up from the Shirwa plains. All the lower slopes of the mountain between the altitudes of 2500 and 3500 feet appear to be suitable for coffee cultivation.

Mount Zomba is flat-topped; its upper plateau lies at an elevation of from 4000 to 5000 feet. There is no very distinct peak. On the south the edge of the plateau rises to over 5000 feet, forming the highest

point, and again on the west the land rises to nearly the same height. I have ascended the mountain from the Residency. The plateau on the top is very similar to the plateau on Milanji, but there is not so much forest and there are no cedars. The greater part is open downland; in the valleys there are large patches of bracken. A fair number of bush-bucks are met with on the plateau, and I have seen traces of leopards and pigs. There are no human inhabitants at the present time, but formerly, before the Yao invasion, there was a large population settled in the upper valley of the Mlungusi, and traces of their villages still remain.

On the south of Zomba a plateau of about 3000 feet elevation stretches towards Chiradzulu, dividing the plains of the Upper Shire from those of the Shirwa watershed. This strip of country is well forested and watered, being traversed by numerous perennial streams, and will undoubtedly in future become valuable land for coffee plantations.

Chiradzulu is a striking mountain rising to a level ridge about 2 miles long, which runs north and south to an elevation of nearly 5000 feet. There is a large native population on its lower slopes settled in numerous small villages. The upper slopes are well forested and watered by numerous small streams.

XII.—ZOMBA TO MPIMBI.

The road from the Residency at Zomba to Mpimbi on the Upper Shire passes round the south end of the mountain. After leaving the Residency it skirts the lower spurs of Zomba into the valley of the Likangala, which it thence ascends. At the head of this valley it crosses the watershed, and descends the steep escarpment of the plateau to the Upper Shire plain, making a fall of about 1500 feet. To form a road for carts down this escarpment will be a matter of some difficulty, but the rest of the route is comparatively easy. From the foot of the escarpment the road runs in a direct line to Mpimbi. The total distance from the Residency to Mpimbi is about 20 miles.

Mpimbi is the port of Zomba on the upper river, and is in direct water-communication with Lake Nyasa. From Mpimbi regular boats run to Fort Johnston with mails and stores.

XIII.—THE UPPER SHIRE DISTRICT.

This district consists of the plains on both banks of the Shire River, from above Matope to within a short distance of Lake Pamalombe, and includes the countries of Liwondi, Kupimbi, Genasu and Mitawa. On the left bank of the river above Mpimbi the spurs of Mount Zomba

reach down to the river, forming hills of limestone, from which is procured lime for building in the Zomba and surrounding districts. The limestone is similar to that of the Blantyre District. The soil of this district is extremely fertile, and on both banks of the river large crops of rice, Indian corn and Kaffir corn are grown by the natives. The general altitude of the plain is about 1500 feet above the sea-level, and much of it is marshy and rather unhealthy for Europeans, but it will always be a district where large quantities of cereals can be raised by the natives. Many parts of it are finely timbered, and in the uninhabited parts there is a great abundance of game. Water-bucks, zebras buffaloes and bush-bucks are found in large quantities, while the koodoo the mpala, and the hartebeest are also plentiful.

Mpimbi was formerly the head station of this district, but, since the late disturbances at Liwondi's, a new station and fort have been formed at the latter place, and that will probably be made the headquarters. Mpimbi will always, however, be an important place as the port of Zomba and probably of Blantyre. Matope, the present forwarding station of the African Lakes Company, although 10 miles nearer to Blantyre, is surrounded by marshes, and can only be reached in the wet season by a road which for nearly 2 miles is knee-deep in water. It is in consequence rather unhealthy. Mpimbi is also the nearest point to Blantyre, where the hills run down close to the river's edge and where a fairly healthy station can be placed.

A direct road is being cleared to connect Mpimbi with the Blantyre-Matope road where it crosses the Lilangwi. Unfortunately the plain lying to the east of the river is infested with the tsetse fly, and cattle cannot be used for transport over this part of the road.

XIV.—FROM MPIMBI TO FORT JOHNSTON.

This is a distance of about 60 miles in a straight line, but the course of the river takes nearly 90 miles. From March till August the river is navigable for vessels drawing 5 feet 6 inches, but during the remainder of the year when the river is low, there are places with as little as 3 feet of water. Above Mpimbi the left bank of the Shire is bordered by the hills which form the lower spurs of Mount Zomba. The current is about 2 miles per hour, and the river from 100 to 150 yards wide. At the village of Kusapa the water becomes rather shallow, and the bed of the river stony. This forms an obstacle to navigation in the dry season, vessels drawing more than 3 feet of water being unable to pass. A short distance higher up, the hills on the left bank recede and the river widens, forming sand-flats. Here the channel in the dry season has only 3 feet of water. From this point up to Lake Pamalombe, the banks on either side are as a rule low, but the river forms a fairly good

channel. Both banks of the river are pretty thickly populated, the chief town passed being Liwondi's, about 40 miles by river above Mpimbi. At Liwondi's there are a number of coastmen settled, and until lately the slave trade was rife, but since the disturbances in March last, a fort has been built on the left bank opposite this village, and slave-trading is stopped for the present.

Above Pamalombe the shores of both the lake and the river are almost entirely uninhabited, owing to the constant slave-raiding which formerly took place in this neighbourhood.

Lake Pamalombe is about 15 miles long, and from 10 miles to 12 miles across. On the west it is fringed by hills, but on the east the country is flat, and the banks are extremely swampy. The water for the most part is shallow; the bottom consists of deep mud, into which a pole can be pushed 10 feet without finding any bottom. There are deeper channels which follow the line of either shore. At the north end, where the river enters, it forms a mud bank, and at times, in the dry season, this blocks the navigation for vessels drawing over 3 feet of water.

The river above Lake Pamalombe is from 100 yards to 150 yards wide, with plenty of water. The distance to Fort Johnston by it is about 15 miles, as it winds considerably. At Fort Johnston, which is situated on the left bank opposite Mponda, the river widens to between 300 yards and 400 yards, and from here to Lake Nyasa it gradually widens, forming a deep bay at the south end of the lake about 5 miles from the fort. There is a sand bar across this bay which sometimes blocks the river for steamers drawing 6 feet of water; but as a rule the bar is passable, and the steamers can come down to the fort.

XV.—THE SOUTH NYASA DISTRICT.

Fort Johnston is the head station of the Nyasa District, which comprises all the country round the south-eastern arm of the lake, and includes the territories of Mponda, Makandaji, and Serafi. Mponda's country lies on the west side of the Shire, and is bounded on the west by the Angoni, on the north-east by the lake and River Shire, and on the south by Liwondi's country. Mponda himself is a Yao, and his subjects are a mixture of Yaos and Manganja. His chief town lies on the right bank of the Shire, opposite Fort Johnston, and is surrounded by a stockade. To the north of it, along the river bank, lie several more large villages. Makandaji's and Serafi's countries are on the east of the lake and River Shire, and at present are in a rather unsettled state. The land along the banks of the Shire, and on the shores of the lake, is extremely fertile, and suitable for the cultivation of all tropical products. Although Fort Johnston lies low, and is surrounded with marshes at the back, it has proved to be a fairly healthy station for

Europeans, and it seems to suit the Sikhs, who are quartered there, very well.

This completes the description of the districts of Southern Nyasaland, with the exception of that of the Southern Angoni, which lies to the south-west of Mponda's country, and is partially within the Portuguese sphere of influence, although their chief, Chikusi, has made a treaty with Great Britain, and our relations with him are extremely cordial. A resident has not yet been sent up to this country.

LIEUTENANT SCLATER'S MAP.—This map is compiled from compass bearings taken by Mr. Sclater, but as he took no astronomical observations, it is based on the positions of Katunga ($16^{\circ} 5' \text{ S. lat.}, 34^{\circ} 51' 18'' \text{ E. long.}$) and Chiromo ($16^{\circ} 30' 57'' \text{ S. lat.}, 35^{\circ} 9' 30'' \text{ E. long.}$) taken by Commander Keane in 1893; on that of Blantyre ($15^{\circ} 47' 30'' \text{ S. lat.}, 35^{\circ} 3' 54'' \text{ E. long.}$) by Commander Keane and Consul O'Neill, and of Zomba by Mr. Last in 1886 ($15^{\circ} 25' \text{ S. lat.}, 15^{\circ} 21' 30'' \text{ E. long.}$).

THE DETERMINATION OF GEOGRAPHICAL LONGITUDES BY PHOTOGRAPHY.

By HENRY G. SCHLICHTER. D.Sc.

MR. COLES, in an admirably-written paper, which he read at the meeting of the British Association at Cardiff, has critically compared the respective values of the different astronomical methods for the determination of longitudes. Occultations take the first place as regards accuracy, whilst, as Mr. Coles points out, lunars as well as the eclipses of Jupiter's satellites are much less reliable. Lunar distances have the great theoretical advantage that they can be observed more frequently than the other just mentioned methods; but as regards the accuracy of lunars measured with reflecting instruments, I entirely share Mr. Coles's opinion, viz., that, although the principle is very simple, the observation becomes in many cases difficult and is liable to errors, so that a single set of lunar distances, even when taken by an experienced observer, is of comparatively little value.

Professor Jordan, the specially-appointed astronomer to Gerhard Rohlfs' expedition into the Libyan Desert, took more than three hundred lunars in the course of that journey, and published an elaborate criticism on the determinations of longitudes by this method, coming to the conclusion that lunars taken by the sextant, or other reflecting instruments, compared with a carefully-laid down itinerary, are of little value.

Lieutenant von Hühnel, the companion of Count Teleki, on his remarkable journey to Lake Rudolf came to precisely the same

conclusion, and has, as he states in *Petermanns Mittheilungen*, intentionally avoided using his own carefully-made lunar observations in the construction of his map, as he found the data of his itinerary much more trustworthy. Professor Jordan therefore recommends to limit the application of this method to coast places and permanent inland stations, where many sets of lunars can be taken and compared. He has found that the average error of a sextant measurement, taken by a freehand observation, is not less than twenty seconds of arc, an error which is too great for a reliable determination of longitudes for scientific purposes. Single lunars are therefore of no scientific value whatever, and it is only by a great number of carefully-selected sets that good results can be expected, as Mr. Coles has pointed out. In the face of this single lunars taken by the sextant or reflecting circle should be entirely avoided by travellers who hurriedly pass through a country, and it follows, therefore, that this method is of very little value for laying down the routes of the scientific travellers of our days.

There remain the methods of moon culminating stars and occultations, but it appears to me that very few travellers consider themselves competent to make this kind of observation, otherwise the number of inland longitudes would not be so infinitely small as it actually is.

Under these circumstances, I think that a method of observation, quite different from those hitherto applied, and combining the frequency, simplicity, and other advantages of the lunar observations, with the accuracy of the method of occultations, will be welcomed not only by the traveller who is obliged to pass quickly through a foreign country, but also to those who possess more detailed astronomical knowledge. This method consists in repeatedly photographing the moon and one of the principal planets or fixed stars within a very short period of time on the same plate.

It was at the meeting of the British Association at Cardiff that, in the course of a conversation with Mr. Coles and Mr. Ravenstein, I first hit upon the idea of determining geographical longitudes in this way. I did not, however, think much about it at the time, and it was only some weeks afterwards that I decided to make some experiments in connection with this matter. As the position of the planet Jupiter in September and October, 1891, was favourable for the purpose, I made my first experiments with this planet. Using an ordinary camera, with a small rectilinear lens, I found that Jupiter could be photographed with an exposure of only five or ten seconds, and that the planet appeared on the negatives as a small black line. The next step was to find out whether stars of less brilliancy than Jupiter could be photographed in like manner, and my thanks are due to Mr. John Thomson, who made a series of exposures by which it was proved that fixed stars may be registered on the plates in precisely the same way as

Jupiter can. The proper motion of the moon was then shown by micrometrically measuring the distances between subsequent exposures of that body, and comparing them with the corresponding exposures of the star on the same plate, and as this too gave very satisfactory results, I constructed a camera for this special purpose.

The ordinary photographic camera is unfit for photographing lunars, for various reasons. In the first place the usual construction with bellows is much too unsteady and shaky for the minute accuracy which the micrometric measurements require. Secondly, as a series of parallel exposures has to be taken in as short a time as possible, the dark slides of the camera must be movable; and thirdly, the distance of the plate from the lens must be carefully kept the same during the whole process of an observation, as this distance forms an important factor in the computation of the results.

The camera which I have had constructed fulfils all these requirements. It consists of a simple rectangular wooden or metal box, with rigid walls. The back of the camera is fitted with springs which, while allowing the dark slides to move upwards, keep them at intervals of $\frac{3}{8}$ inch from each other. For bringing the objects into position a plate either of ground or of common glass is employed, covering the upper half of the back of the apparatus, whilst the lower half of the camera is closed by a wooden partition. The horizontal line (going through the centre of the camera), which forms the lower end of the glass plate, is provided with a centimetre or inch-scale, which is graduated right and left from the centre with the same figures. The whole arrangement is extremely simple; and not less simple is the process of making the observation itself. The apparatus is pointed in the direction of moon and star, and when both bodies appear on the just-described ground, or clear glass plate, the camera is turned until the line from the centre of the moon to the star is parallel to the scale at the lower end of the glass plate, and then the images of both bodies are brought down to this line, and made equidistant from the centre. In this position they are brought into focus, and then the whole apparatus is firmly screwed down. The object of this arrangement is to bring the bodies always into a plane passing through the principal axis of the lens, and to have them at equal distances from the point where the principal axis cuts the plate. Then the dark slides are substituted for the glass plate, and after the time has been noted, a series of exposures is taken, the dark slides being lifted at the end of each exposure by means of the before-described springs. I usually make exposures of fifteen or twenty seconds duration, with fifteen or ten seconds interval, so that two exposures are made in every minute.

For the elimination of all possible inaccuracies of the photographic film, or of the lens, the lunar distances thus registered are checked by repeatedly photographing on the same plate two fixed stars, the positions

of which are taken from the *Nautical Almanac*, or from a star catalogue, and the angular distance of which can easily be computed therefrom. The plates are then developed, dried, and the distances between the star and one of the limbs of the moon measured by the negatives. About the method of measuring I shall speak afterwards. It will be seen that the apparatus as well as the method of observation are both of the utmost simplicity. There is no levelling and no reading off of angles whatever required, and the whole observation consists in adjusting the camera to the moon and star, bringing them into the centre of the apparatus, and making in rapid succession a set of exposures. *Of course the local time as well as the geographical latitude must be known, and the thermometer and barometer read off in the usual manner.* The results which I have obtained in photographing lunars in this way, prove that a better method as regards accuracy and simplicity could hardly be found. The simplicity of the method I have already explained, and I will merely add that a knowledge of the principal stars of the heavens, viz., those of first and second magnitude, is amply sufficient for the practical application of this new method, whilst experience in photographing need not go any further than to the preparation of the negatives, which is in this case a most simple process with which anyone can make himself thoroughly acquainted in a few hours, as nothing else is required on the plates than a black image of the stars and of the disc of the moon.

Several objections have been raised against this method.

Why should a traveller, besides his sextant or theodolite, take an additional apparatus with him?

Would this new method be accurate enough to compete with the various old ones?

Consider how infinitely small is the number of reliable longitudes which have been taken in the interior of countries other than Europe and North America. Take for instance Africa. Many scientific travellers have during the last century explored this continent in every direction, and the correct laying down of their route was the principal object with all of them. And how many correct longitudes are the result of their joint efforts? Dr. Lüddekke is of opinion that there are, up to the present time, hardly a dozen well-determined longitudes to be found of the interior of Africa. Many of our famous explorers, *e.g.* Barth, did not even try to make astronomical observations, and how unreliable the results of many others who made them are becomes evident if we compare the longitudes which different travellers give of the same localities. Of course there are exceptions, like O'Neill's determination of Blantyre, Dr. Vogel's route to Lake Chad, and others; but, generally speaking, as regards astronomically well-determined positions, the interior of Africa is to-day almost as much a *terra incognita* as it was a hundred years ago. The reason of this complete failure is evidently twofold—firstly that the reliable

methods are too complicated or difficult for the majority of travellers, and secondly that several of the instruments as well as of the methods employed are not accurate enough.

As regards the accuracy of my new method I am glad to be able to show that it surpasses by far anything that has been obtained by reflecting instruments.

Mr. Coles has shown that any method which does not determine the position of the moon within $\frac{1}{120}$ of her diameter, is not accurate enough for the determination of longitudes, or, taking the average diameter of the moon as 1867 seconds of arc, the instruments employed for the measurement of lunar distances must have at least an accuracy of 15 seconds of arc.

I give a table which represents different sets of lunars photographed by my above described camera. The distances are expressed in millimetres and decimal parts of a millimetre each. Each single lunar distance is taken at an interval of half a minute from the preceding one, and I beg the reader to notice the increase of the distances from the beginning of the observations to the end.

Lunar Distance.	Lunar Distance.	Lunar Distance.	Fixed Star Distance.
Venus and Moon, March 31st, 1892.	Spica and Moon, June 5th, 1892.	Jupiter and Moon, October 7th, 1892.	Sirius and Rigel (β Orionis), March 4th, 1893.
(1) 13·442 mm.	(1) 20·646 mm.	(1) 106·816 mm.	(1) 138·153 mm.
(2) 13·459 „	(2) 20·655 „	(2) 106·833 „	(2) 138·153 „
(3) 13·468 „	(3) 20·663 „	(3) 106·859 „	(3) 138·153 „
(4) 13·476 „	(4) 30·672 „	(4) 106·876 „	(4) 138·153 „
(5) 13·485 „	(5) 20·680 „	(5) 106·893 „	(5) 138·153 „
(6) 13·493 „	(6) 20·697 „	(6) 106·918 „	(6) 138·153 „

These figures speak for themselves. The sets were taken with an aplanatic (*rapid rectilinear*) lens of Dallmeyer's, an angle of 34° of this lens corresponding to 200 millimetres. The micrometric measurements were made with a Zeiss microscope provided with Professor Abbe's illuminator, the limit of accuracy being $\frac{1}{100}$ of a millimetre. This amount therefore corresponds to six seconds of arc for every exposure. But as a set of at least sixteen lunars is always taken, the accuracy, according to Professor Jordan, becomes three to four times greater, and is consequently at least two seconds of arc for every single observation. All this is done within the space of a few minutes with a comparatively small lens, and you see that this accuracy surpasses *more than seven times* the standard figure which Mr. Coles has computed as necessary for an efficient lunar observation.

Professor Vogel, one of the greatest authorities on stellar photography, recently stated in an address to the Berlin University, that his methods

of photographing stars permitted twenty times more accurate measurements than is possible with any other methods of precision. Comparing photographic lunars with the usual sextant method, the superior accuracy of photography as applied to heavenly bodies is confirmed. Anybody acquainted with micrometric measurements can easily verify these statements. All that is necessary is, as I have said before, an illuminating apparatus of Abbé's construction attached to the microscope; and, moreover, a strong, direct light (either sunlight or an incandescent or Welsbach lamp) for the observation.

As only small distances can be measured micrometrically I am using an astronomical *réseau*, on which the lines are 5 millimetres distant from one another. This *réseau* is screwed down upon the plate, and the whole millimetres are then read off whilst the decimal parts are determined micrometrically. This *réseau* is the same as that used at all the principal observatories of the world for measurements in stellar photography, and I obtained the *réseau* which I am using from the Royal Observatory at Greenwich. The absolute accuracy of the measurements is therefore beyond dispute. Moreover, Messrs. Troughton and Simms, the well-known mathematical instrument makers, have constructed me another millimetre scale for micrometric measurements, which I have compared with the *réseau*, and which is just as accurate in its results.

I have said before that my results are obtained with a comparatively small lens. By using aplanatic lenses of the same kind, but one or two sizes larger, the accuracy of the results can be further greatly increased, provided that we take stars as near as possible in the moon's path. Of course, the larger the lens, the smaller will be the angular distances included in the field, if we keep the photographic glass plates within reasonable size. But small distances are no disadvantage, on the contrary they are a decided advantage, because the conditions of the atmosphere in the same part of the sky are always alike, which is not necessarily the case with large distances. The chief reason why large lunar distances are usually used for observations with reflecting instruments, is the well-known property of the latter—to give only half the angle of the measured angular distance. For this reason small distances are not printed in the *Nautical Almanac*, but everybody knows that the distances can be computed directly from the right ascensions and declinations of moon and star, which are given in the *Nautical Almanac*.

I leave it to be decided—after what I have said—whether it will be worth while for future travellers to add to their outfit a camera adapted for the observation of photographic lunars. In that well-known book, 'Hints to Travellers,' travellers are advised to take with them a camera and not less than three different kinds of photographic lenses, one of them being the identical Dallmeyer

lens which I am using for photographic lunars. Hence the only additional outlay will be the camera.

I have to add that the apparatus and the method described have nothing whatever to do with the so-called photo-theodolite and the photogrammetric measurements made with the same. The complicated construction of the latter instrument makes it inferior for astronomical observations to the ordinary theodolite with which it is almost identical, differing only in the addition of a photographic camera. Some astronomical work has been done with the photo-theodolite, latitudes especially having been determined by it, but the results were not very satisfactory. Mr. Ravenstein was therefore fully justified in stating in his presidential address to the Geographical Section at the meeting of the British Association at Cardiff, that the photographic camera had not as yet been utilised for ascertaining the relative positions of heavenly bodies.

What I claim for my new method is, as I have said before, the extreme simplicity of the apparatus, and the minute accuracy of the results.

I have to express my most sincere thanks to a number of gentlemen who have been kind enough to render me valuable assistance. In the first place I have to thank Mr. H. H. Turner, M.A., F.R.A.S., Chief Assistant of the Royal Observatory at Greenwich, and Captain Wharton, R.N., F.R.S., Hydrographer to the Admiralty. Mr. W. H. Simpson of the Royal Geographical Society has given me much useful practical assistance. To Captain Wharton I am indebted for his kindness in providing me through the Greenwich authorities with a box chronometer and with a pocket chronometer.

But not less my thanks are due to Mr. J. Coles, the Society's map curator, and Mr. John Thomson, the Society's photographer.

In conclusion I may be permitted to add that the results which have been obtained with this new method, prove that it will in future do good service to geography, and that the most difficult problem of mathematical geography, viz., the astronomical determination of geographical longitudes, is now solved by a simple process which could, I feel sure, hardly be more convenient in its application and more accurate in its results.

A VOYAGE TOWARD THE ANTARCTIC SEA, SEPTEMBER 1892 TO JUNE 1893.

In September 1892 a fleet of whaling vessels, the *Balæna*, *Active*, *Diana* and *Polar Star* sailed from Dundee to prosecute whale-fishing in the Antarctic Sea. By the intervention of Mr. B. Leigh Smith, the surgeons for the two larger vessels were selected with a view to their scientific

acquirements, and equipped by him and others with a complete set of instruments for collecting natural history specimens and observing the meteorological and other physical conditions of the region where they would pass the southern summer. The Royal Geographical Society gave a grant of instruments, including chronometers and standard compasses to the vessels so that their position might be ascertained more accurately than the instruments ordinarily used by whalers would permit. The captains of the vessels were requested to report on their observations to the Society, and Captain Robertson of the *Active* has done so. This report with chart, and accompanied by the very detailed reports of Dr. Donald, who sailed on the *Active*, and Mr. Bruce on the *Balæna*, are being prepared for publication in a separate form by the Society. Meanwhile the following preliminary reports are published in view of the interest attaching to the paper on Antarctic Exploration which will be read by Dr. John Murray, of the *Challenger*, at an early meeting.

PRELIMINARY REPORT BY WM. S. BRUCE.

After a boisterous passage of over 100 days, we met our first iceberg on December 16th in $59^{\circ} 40' \text{ S. } 51^{\circ} 17' \text{ W.}$, and a second berg was passed on the same day. We continued on a more or less southerly course, passing to the east of Clarence Island, the most easterly of the South Shetland group; Danger Islets were sighted and passed on December 23rd, and on Christmas Eve we were within one mile of Ross's position of New Year's Day half a century ago. Ross was the first to visit this part of the Southern Seas, and we had the honour of paying the second visit. From this time until the middle of February we circled round this position roughly between latitudes 62° S. and $64^{\circ} 40' \text{ S.}$ and longitudes 52° and 57° W. , our westerly boundary being that part of Terre Louis Philippe which forms Erebus and Terror Gulf, bounded to the southern extremity by Seymour Island and to the north by Joinville Land.

Land.—On the *Balæna* we were unfortunate in never being within six miles of the land, except in the case of the Danger Islets; Captain Larsen, however, of the Norwegian barque *Jasen*, who seemed to be interested in exploration, effected a landing on Cape Seymour, where he obtained several fossils, as well as on the South Orkneys. Dr. Donald also was fortunate in this direction, and he will relate his own experiences. What land the *Balæna* saw was entirely snowclad, except on the steepest slopes, where the snow could not lie. These parts appeared to be quite black, and so far as I could judge were of igneous origin. The few rocks I obtained from the ice and from the stomachs of penguins bear this out, Prof. James Geikie finding olivine, basalt, basalt lava and possibly gabbro among them. Rock

fragments and earthy matter were seen on some of the bergs and ice. On January 12th we saw what appeared to be high mountainous land and glaciers stretching from about $64^{\circ} 25' \text{ S. } 59^{\circ} 10' \text{ W.}$ to about $65^{\circ} 30' \text{ S. } 58^{\circ} \text{ W.}$; this I believe may have been the eastern coast of Graham's Land, which has never before been seen. But it would be unwise to be too certain, for it must have been 60 miles distant from us, and Ross found that in these regions one is not only liable at some future time to sail over one's own land, but occasionally also over that laid down in the chart by other folk. We were unable, however, to make further investigation, for our vessel was not yet filled with blubber. Ross calls the attention of future visitors to doubtful volcanic activity in Joinville Land; there is certainly no sign of present activity.

Bergs.—The whole of this district south of 60° S. is strewn with bergs, and south of 62° S. they become very numerous. No entire day can be recorded when bergs were not seen. South-east of Danger Islets they were most thickly distributed. Here I have counted at one time from deck as many as sixty-five, all of great size, to say nothing of smaller ones. In December many lay 60 to 100 miles north-east of Joinville Land, and likewise in January, in about $64^{\circ} 30' \text{ S.}$ and 54° to 56° W. The longest was about 30 miles long, another about 10 miles, and several were from 1 to 4 miles long. The highest berg the *Balæna* saw was about 250 feet high; but many were not over 70 or 80 feet, the average possibly being about 150 feet high. All these bergs are tabular, or weather-worn varieties of the tabular forms. They become pierced with caves, and these are sometimes connected with funnel holes, through which, as the swell beats up the caves, immense columns of spray are projected. They may be finely castellated, pillared, or arched. One that I saw was beautifully conical. The base of the bergs is coloured pale brown by marine organisms, and other brown streaks are seen beyond the water-level. I failed to observe any luminous glow. Mr. Burn Murdoch has admirably depicted these bergs in numerous paintings. They present a magnificent appearance. Clothed in mist they raise their mighty snow-clad shoulders to a stately height, or shine forth brilliantly in the sun. Although they are of the purest white, yet they glow with colour. The crevices exhibit rich cobaltic blue, and everywhere are splashes of emerald green.

Pack Ice.—The pack ice is said not to be heavier than that of the north, and is similar in nature. It is frequently coloured brown by a diatom *Corythron cryophyllum*, which swarms in the water near the main pack. We first met the pack ice on December 19th in $62^{\circ} 20' \text{ S.}, 52^{\circ} 20' \text{ W.}$; it was dense and ran east and west. In January we met the pack edge running east and west in $64^{\circ} 37'$ from about 54° W. to 56° W. On January 12th, when off Cape Lockyer and in sight of

what I believe was the easterly coast of Graham's Land, we saw what appeared to be open water to the south, and, possibly, I think we might have penetrated very far to the south, and even, perhaps, to have attained a higher latitude than our brave and distinguished predecessor, Captain James Weddell. We might, at all events, have made a closer examination of what we believed to be the easterly coast of Graham's Land. Deeply to my disappointment the ship turned back again to literally soak in blood.

Sea.—The colour of the sea varies from a dirty olive-brown near the pack edge to a clear blue further from it. In the bluest water it was most profitable to hunt for seals. Deep-sea temperatures were taken and a colder intermediate stratum was indicated. Dr. Buchan tells me the conditions are similar to those north of the Wyville Thomson ridge. This is the first occasion on which the Negretti and Zambra thermometer and Dr. Mill's reversing frame were used in such high southern latitudes. A few observations on the freezing and melting point of sea-water were obtained. We never experienced any very great swell. Some few observations for currents were made, and floats were thrown over from the ice to some degrees north of the equator. Bergs seem to induce currents. The lead was cast in the vicinity of Danger Islands, and some few bottom samples were obtained. These are being examined by Dr. John Murray, of the *Challenger*, and Mr. Robert Irvine. The depth varied from 70 fathoms to 300 fathoms and no bottom. I brought home several water samples, and these Dr. Gibson and Mr. Robert Irvine find to be similar to samples obtained from high northern latitudes.

Meteorology.—Periods of fine calm weather alternate with very severe gales, usually accompanied by fog and snow. The barometer never attained 30 inches. The records of air temperature are very remarkable; our lowest temperature was $20^{\circ}\cdot8$ Fahr., our highest $37^{\circ}\cdot6$ Fahr., only a difference of $16^{\circ}\cdot8$ Fahr. in the total range for a period extending slightly over two months, compare this with our climate; where in a single day and night you may get a variation of more than twice that amount. The average temperatures show a still more remarkable uniformity.

December averaged $31^{\circ}\cdot14$ Fahr. for one hundred and fifteen readings; January $31^{\circ}\cdot10$ Fahr. for one hundred and ninety-eight readings; February $29^{\circ}\cdot65$ for one hundred and sixteen readings, a range of less than $1\frac{1}{2}^{\circ}$ Fahr. This I consider to be very significant, and worthy of special attention to future Antarctic explorers, for may it not indicate a similar uniformity of temperature throughout the year. Antarctic cold has been much dreaded by some; the four hundred and twenty-nine readings I took during December, January, and February show an average temperature of only $30^{\circ}\cdot76$ Fahr.; this being in the very height of summer in latitudes corresponding to the Faroe Islands in the

north, but I believe the temperature of winter will not vary very much from that of summer. This uniformity of temperature partly accounts for the great accumulation of ice which is formed, not on account of the great severity of the winter but because there is practically no summer to melt it. The conformation of land and sea in the south also seems to bear this out. Let us follow out Harvey's motto, "to seek and study the secrets of nature by way of experiment." Personally I am not in a position, as far as pecuniary resources are at my command, to undertake this work, but my heart is in it, and if by any means the chance is given me I am ready to winter in the Antarctic.

On February 18th we steered for the Falklands. The following afternoon we sighted Clarence Island, its three bold ridges looming through mist and scud. The land was wild and majestic, towering over the adjacent bergs. It was entirely snowclad except on the steepest slopes, which chiefly face the south. On February 19th we passed our last iceberg in about $60^{\circ} 27' \text{ S. } 53^{\circ} 40' \text{ W.}$, *i.e.* 40 miles north of Clarence Island. Port Stanley was reached on February 25th, Portland on May 24th, and finally on May 30th we came to rest at Dundee.

Mr. Seeböhm has vividly pictured the onrush of summer in the Arctic; but how different in the Antarctic. There, there is eternal winter, and the snow never melts. As far north as man has travelled he has found reindeer and hare basking in the sun, and country brilliant with rich flora; within the Antarctic circle no plant is to be found.

Long shall I remember the beauties of these ice-bound scenes, the grandeur and the silence. One's feelings cannot be expressed, one's thoughts cannot be fathomed as one stands alone during the night-watches on a deserted deck while the sun skirts the horizon and paints the world with colour, and the white ice floats in the calm black waters.

PRELIMINARY REPORT BY C. W. DONALD, M.B., C.M.

Any information, however slight, about places so little known and so seldom visited as the Antarctic lands is of value to the scientist and geographer. The Antarctic expedition was originally proposed by a Dundee company as a commercial undertaking, the object of which was to discover and capture a true whale-bone whale living under similar conditions to the black or Greenland whale of the north. The idea of combining with this some scientific research originated with Mr. Leigh Smith, who brought the subject to the notice of the Royal Geographical Society.

Leaving Dundee in September of last year we had a pleasant though somewhat stormy voyage out. The fleet consisted of four ships. Mr. Bruce and Mr. Burn Murdoch travelled together on the *Balæna*, while I was accommodated on board the *Active*. Both of these ships were thoroughly fortified for work among ice, and had spent many years

in Greenland and Davis Strait. The captains were perfect masters of the somewhat difficult subject of ice-navigation, and seemed to feel at home once more when we reached the smooth, quiet waters of these ice-bound regions.

On the passage out we, on board the *Active*, touched at the beautiful Island of Madeira in October, and two more months landed us in the barren Falkland Islands. Sailing thence on December 11th, we crossed the stormy waters to the east of Cape Horn, and saw our first iceberg on December 18th. On the same day we sighted Clarence Island—one of the South Shetlands. These are called after our own northern Shetlands, and the part sighted by us lies only some 60 miles nearer the pole. But what a difference between the two places. Our own Shetlands bright with ladies dressed in light summer garments, and carrying tennis racquets and parasols, the South Shetlands, even in the height of summer, clad in an almost complete covering of snow, only a steep cliff or bold rock standing out in deep contrast here and there, the only inhabitants being birds or seals; and even the bird-life, with the exception of the penguins, is scanty. Sir James Ross on his third voyage entered the ice at nearly the same spot, and fifty years before—all but a week—had sheltered from a westerly gale under the inhospitable shores of Clarence Island. Its highest point stands 4557 feet above sea-level.

For a few days after this we were delayed by fog—a frequent occurrence among ice both in the south and in the north. On December 23rd we sighted Danger Islands, lying immediately to the east of Joinville Island. The sea around them was thickly studded with icebergs, most of which were aground, and many of large size. These bergs require a word of description. Unlike those seen in the north, they are quite flat on the top, their sides forming perpendicular cliffs of 100 feet to 200 feet in height. In shape they are roughly quadrilateral. Many of them were over a mile in length, and we saw one which was at least 30 miles long. These enormous masses of ice are probably built up where the land forms a long gentle slope from a considerable height down to the sea-shore, the same slope continuing for a mile or more out to sea. Snow accumulates on this slope and gradually slips out to sea, forming what is called an ice-foot. The outermost portion of this at length reaches a depth at which it can float, and soon breaks off to form a berg. Taking the average snowfall as one inch a day, that is to say, about 30 feet a year, the foundations of each of these bergs must have been laid down about sixty years before it becomes a separate entity. Now the question naturally arises—why should these bergs differ so much from the high pinnacled bergs of the north? The latter, it is well known, are formed from deep glaciers, running in narrow ravines. But still this does not answer the question. I think the explanation must lie in the geological structure of the two lands. That in the north is composed for the

most part of water-bedded rocks, while in the south no sedimentary formations have been seen—all the coast-line at least being of volcanic origin, and, therefore, as the geologist would explain, not conducive to the formation of deep ravines. This question, however, would require to be treated separately and at length by the geologist.

Passing Darwin Islet, the most southern of the Danger Islands, we caught a glimpse of Paulet Island through the mist. The latter is a high conical island rising to 750 feet above the sea. The mist and fog which prevailed during the first five days of our stay amongst the ice prevented our having a good view of any of these places, and concealed Joinville Island altogether. Some days later, however, we had an opportunity of examining them more closely. On December 23rd we fell in with two of the other ships belonging to the Scottish fleet, and on the 24th the three of us steamed up and anchored to a large ice floe in lat. $64^{\circ} 23'$ S., long. $56^{\circ} 14'$ W. From here we had a magnificent view of the mountains of Palmer's Land, lying to the south of the Erebus and Terror Gulf. These seemed to form a small chain, culminating in the peak of Mount Haddington, the height of which Ross gives at 7050 feet. The scene on that evening from the ship's deck was one of the most impressive I have ever witnessed. To the west lay this chain of snow-clad mountains, thrown into various shades of light and dark by the low sun, with here and there the face of a cliff or black rock standing out in deep contrast to the surrounding snow. To the south the ice-floe, studded with numerous small bergs and hummocks, stretched as far as the eye could reach; out to the eastward lay a long chain of bergs, their perpendicular faces tinged bright red by the sun's rays. Between these bergs and the floe lay an open expanse of dark water. To the north was the loose scattered ice, small bergs and dark water channels, through which we had just steamed. Throw over this the lilac glamour so frequently seen in the Antarctic, which, combined with the absolute stillness and quiet, broken only occasionally by the splash or harsh "quangk" of a penguin, or the soft "tweet" of the snow petrel, made up a magnificent and imposing spectacle. Christmas Day was one to be remembered. The greater part of it was calm with bright sunshine. During the early part of the afternoon the temperature of the air rose to 37° Fahr. The atmosphere was very clear. By daylight the scene seemed somewhat harsher in outline; but in the twilight, with the sea like a mirror, and slight ice forming on the surface, the effect was, if possible, enhanced, and acted on one like a spell. On December 30th we again found ourselves in the neighbourhood of Paulet Island, and for the next ten days we had excellent opportunities of observing the lie of the land about the southern portion of Joinville Island.

Paulet Island does not appear quite so formidable as Ross describes it. Its height is 750 feet. In shape it is more or less conical. Its north side, of which I am fortunate enough to possess a photograph, is

almost clear of snow, and presents a shelving beach covered with loose stones. On these numerous penguins and seals were lying. This beach forms the termination of a triangular valley, which cuts deeply into the face of the hill. We did not attempt a landing here, though such could easily have been effected. A bare rock, lying to the north of Paulet Island, we recognised as Eden Islet.

To the west of Paulet Island the land is low, forming, as we discovered some days later, a separate island. To the north the land slopes rapidly up into a small cluster of hills, the highest point being a remarkable double peak called by Ross Mount Percy, and rising to a height of 3700 feet. The whole southern slope of this seems to form one glacier, the bergs yielded by it being from 30 to 60 feet high. Many of these were heard and seen to break off. A few came down in the form of a small avalanche, causing a loud noise which could be heard for many miles around. Lying to the north of Paulet Island, and forming an indentation between the low and the high land, is what we took at the time to be a deep bay. Ross indicates the position of this in his chart. It turned out later to be the eastern entrance to the channel which separates Joinville Island from the long flat island lying to the south of it. In the north of the Erebus and Terror Gulf lie several small islets. Two of these are high, conical, crater-shaped rocks lying 4 or 5 miles off the north shore.

Ross was quite right in supposing that a passage exists between Joinville Island and Louis Philippe Land, leading from the Erebus and Terror Gulf into Bransfield Straits on the west. Through this passage a considerable tide runs with the ebb and flow, and we felt a slight westerly swell on nearing it. I have no recollection of seeing the tower-shaped rock which Ross called D'Urville's Monument, but in nearly the position assigned to it, though further inland, is a conspicuous hill about 600 feet high, with a bare conical summit. This, looked at from the south, might easily be supposed to rise from the low land near the shore. Near the western extremity of Joinville Island, called by Ross Point Bransfield, we discovered a channel running inland in an easterly direction. At the entrance were two penguin rookeries, one on each shore. I landed on the shore to the south, collected specimens of the rocks and visited the rookery. The specimens are at present being examined by Professor James Geikie. They consist chiefly of igneous and schistose rocks, the former mostly basalts. The rookery was occupied by a somewhat rare variety of penguin, the white-headed form or *Pygosculis Papua*. These birds have a much harsher cry than any of the other varieties seen. There were only some forty to fifty nests altogether. The beach on which they are situated forms a long low point, the surface of which was bare and made up of small, flat angular stones. A few patches of moss here and there, and the seaweeds along the shore formed the only vegetation. Proceeding eastwards along the channel which our captain has

named "Active Sound," it was found to average about 2 miles in breadth for the first 8 to 10 miles. The two shores are nearly parallel, and each is lined by an ice-foot or cliff, that on the north shore being about 60 feet in height, while the opposite one is somewhat lower. Here and there a rock or small beach showed beneath the ice-foot.

About 3 or 4 miles from the entrance we passed the conspicuous hill already referred to. It is situated on the north shore and rises very abruptly to a height of 600 feet. It forms a single isolated peak; soundings taken in this part of the channel gave no bottom at 40 to 60 and 80 fathoms. On the north shore the snow slopes rapidly up from the ice-foot, being here and there broken by a long crevasse or creek, or a black corner of rock standing out. On the south shore the slope is much more gradual; the snow rises in one unbroken slope to the height of 100 to 150 feet. As we proceeded eastwards the channel became broader, and was found to be continuous with the inlet seen to the north of Paulet Island. It thus cuts off the southern portion of Joinville Island as a separate island. To this our captain gave the name of Dundee Island. It forms a long, narrow snow-covered plain, the highest point being not more than 150 feet above sea-level. Its total length, from Point Bransfield to Cape Purvis is 29 miles, its average breadth about 4 miles. The channel is broadest about the centre, where it measures 5 miles across. From this point it narrows towards the eastern entrance, which is about 4 miles across. About the middle of the channel, on the north shore lies "Gibson Bay," bounded on the east by the prominent headland called "Cape Alexander." In the hard black rock here exposed are several strata of a lighter colour and softer material, dipping to the south at an angle of 45°. These appeared to be of sedimentary formation.

Immediately to the east of Cape Alexander is a deep fiord running inland and turning to the west, towards the head of Gibson Bay, thus converting the headland into a small peninsula. To the eastward were two penguin rookeries, one of very large size, and occupied by countless numbers of the common or black-throated penguin.

Lying opposite Cape Alexander on the south shore is a sunken reef, on which we had the misfortune to strike. Though a gale of wind was blowing at the time no serious damage resulted, the ship being got off in about six hours little the worse of the accident.

Working to the south through the Erebus and Terror Gulf, the land to the west is indistinctly seen as a range of low hills. The peninsula which forms the southern boundary is deeply cut into by an arm from the gulf called by Ross Admiralty Inlet. The land to the east of this rises in a long, unbroken snow-covered slope to a height of 2000 feet and has received the name of "Snow Hill." A long low island separated from the Snow Hill by a narrow channel completes the eastern boundary. To the west of the inlet, the imposing mass of Mount

Haddington rises in successive volcanic terraces. Captain Larsen, of the Norwegian ship *Jasen*, landed on the island to the north of Snow Hill, which may be called Seymore Island, and obtained there a number of fossils—specimens of which are now in the hands of Prof. James Geikie. They are mostly jurassic forms. Captain Larsen reports that he found no traces of vegetation there, the surface being formed of volcanic *débris* and numbers of these fossils.

One more note with regard to land. We were not in a position to see the land described by Mr. Bruce as lying to the south-west of Cape Lockyer, but Captain Larsen reports having seen land in the same place. I am inclined to think that this is the eastern shore of Graham's Land, that is to say, part of the mainland or continent itself. The probability is that the rest of the land seen forms a group of islands lying to the north of this mainland.

Ross did not reach the latitude of 65° on this meridian, being stuck in pack-ice lying off Cape Lockyer. My impression is that round this cape is a complex series of currents, which collects pack-ice and so forms a barrier impenetrable by any ship without steam. Two of the steamers—the *Diana* and the *Jasen*—worked through this and approached nearly to the 65^{th} parallel. They both report that they could easily have gone further had they seen any advantage to be gained from it, there being plenty of water-channels through the ice. This was in the end of January, or beginning of February, a short time after a long-continued southerly gale, and it is interesting to note that the pack met with by them at this time was wholly composed of sheets of thin bay ice. Out to the eastward lay a continuation of the long chain of bergs to which I referred before.

An expedition composed of two ships devoted solely to scientific pursuits could do an immense amount of work here. I have talked this matter over with various men interested in whaling, and have come to the conclusion that such an expedition could be undertaken for one season at the very small expense of £4000 for each ship. It is useless to trust to the sealers for exploring purposes, for as long as they can fill their ships with blubber in latitude 64° they will never penetrate to 65° .

THE RUINS IN MASHONALAND.

MR. SWAN has made several discoveries of fresh ruins on his way up to Fort Victoria, and writes as follows to Mr. Theodore Bent:—

July 13th, 1893.—At the Lotsani I found one set by the side of the road and about $\frac{3}{4}$ mile from the drift, and about 200 yards from the Limpopo. Another set was nearer the Limpopo and the drift. Besides these I found several shapeless heaps of stones. I was delighted

to see that they were of the Zimbabwe period, although the workmanship was not quite so good as at the great temple. The courses were fairly regular, and the battering back of each successive course and the rounding of the ends of the walls were very cleverly done. The walls were built on circular curves, and of the same gneissose granite as Zimbabwe. The doorways had places for stakes. I found that the length of the radius was equal to the diameter of the Lundi temple, or the circumference of the great tower. I then proceeded to orientate the temple. The sun was nearly set. I sat on the centre of the arc, and was delighted to find that the sun descended nearly in a line with the main doorway. I then recollected that the winter solstice was only seventeen days past, and on allowing for the difference in the sun's declination for that time, I found that a line from the centre of the arc through the middle of the doorway pointed exactly to the sun's centre when it set at the winter solstice. The other ruin is also orientated to the setting sun.

July 16th, 1893.—I found two ruins and several heaps of fallen stones on the left bank of the Lotsani River at its junction with the Limpopo, both built in the same style as Zimbabwe. Having but little time, I devoted myself entirely to the smaller of the two, and found that the sun, when setting at the winter solstice, would shine through the middle of one of the doorways on the centre of the arc. This, I fancy, places our theories regarding orientation and geometrical construction beyond a doubt.

August 7th, 1893.—I have a really splendid bagful of ruins. At the Lotsani there were two (which I have already described), in the Lipokole Hills two, near Semalali four, and one actually within 300 yards of the mess-room at Maclutsie. I am going to see one on a ridge above the Makalanga village, up the Shashi, which you visited with Captain Nisbet. I also hear of one lot on the Ipagi River, this making a dozen in all. I was able to fix the radii of two curves of the one at Maclutsie, and of four curves near Semalali, and they are all constructed on the Zimbabwe plan. The two on the Lipokole Hills are fortresses, and are not built on the plans of the temples. The temples generally seem to consist of two curves only, and are in half-moon shape, and seem never to have been complete enclosures. I have not been able to settle the orientation of any of them yet. I shall send plans later. Although all these temples are built of very rough stones, no good ones being obtainable, yet the curves are extremely well executed, and are generally true in their whole length to within one or two inches.

I made some excavations in a small tumulus at the great ruin near Semalali. The tumulus consisted of wood-ashes, stones, soil, and much pottery and bones. I found the little sun images of terra-cotta, and some fragments of *very fine* pottery. Some pieces were peculiar in shape. One, not a very fine piece, had curious decorations on a *concave*

part. Another was a very curious nozzle of a jar, and another had one of those holes for suspension like the Antiparos pots. I also got a fragment of an ivory bracelet (plain).

September 5th.—Near the 'Msingwani River are seven lots of ruins, and of these at least three were by the Zimbabwe people. I measured the radii of three curves here—17: 17, 27, and 27 feet respectively, and they were laid off with wonderful accuracy.

The ruin at the Lundi River, which we did not measure accurately on our way up, is also very interesting. One door is to the north, and the other 128° and a fraction from it; so that the line from the centre to the sun rising at midwinter bisects the arc between the doorways. If one could measure the circumference of this arc with sufficient accuracy, we could deduce the obliquity of the ecliptic when the temple was built. I made an attempt, and arrived at about 2000 B.C.; but really it is impossible to measure with sufficient accuracy to arrive at anything definite by this method, although from it we may get useful corroborative evidence.

September 8th.—I hope to spend two days and a night at Zimbabwe.

Major Sir John C. Willoughby has written a short record* of five weeks' work at the Mashonaland ruins in continuation of that done by myself in 1891. A few additional objects have been found, but in the list of things found, which Sir John places at the end of his pamphlet, I see hardly anything except duplicates of those found by me. One object, however, may be of use in considering the question of the original constructors of these ruins, which Sir John describes as "a piece of copper about six inches in length, a quarter of an inch wide, and an eighth of an inch thick, covered with a green substance (whether enamel, paint or lacquer, I am unable to determine) and inlaid with one of the triangular Zimbabwe designs." Also some very fine pottery was discovered and crucibles with specks of gold in them, similar to those found by me. Sir John objects to Mr. Swan's theories respecting the construction of the temples, but, as he says, "Mr. Swan has chiefly based his theory of the orientation of the temple" on the existence of a hole in the wall, he shows that he has not grasped the point at all. The said hole in the wall had nothing whatever to do with Mr. Swan's theories, but was the basis of an entirely subsidiary theory, which from want of data to go upon was abandoned. Mr. Swan writes that on his journey up to Victoria he has measured no less than twelve ruins, and since they all agree with his theory respecting the orientation and curves of the great Zimbabwe ruin, all doubt is removed from his mind concerning their accuracy. Sir John attacks me on a few points connected with the natives,

* 'Further Excavations at Zimbabwe,' by Major Sir John Willoughby. Philip & Son.

but again he appears to have read my statements inaccurately. "Mr. Bent," says Sir John, "refers to the word *piccanini* as a term of native origin . . . *piccanini* is not a term proper to the native dialects, but one which was introduced by the white man and adopted by the native." On the contrary, I say ('Ruined Cities of Mashonaland,' p. 58), "Anything small they term *piccanini*; the word is universal and points to intercourse with other continents." Again Sir John quarrels with me because I call *Muali* a god, whereas Sir John says "it is a spirit." The solution of this disputed point had perhaps better be referred to the missionaries. Sir John also disputes the altitude of Fort Victoria as given by Mr. Swan, preferring the value 3600 feet to 3200 feet. Mr. Swan writes that he confidently hopes to do some more work at the ruins after the present troubles are over and the rainy season past.

J. THEODORE BENT.

FORMOSA.

A FOREIGN Office Report (Commercial No. 11 (1893)), "On the Island of Formosa, with special references to its Resources and Trade," has been written by Mr. Hosie. It is a document of very great value geographically and commercially, dealing with the island as a whole; and it reaches us together with a series of photographs of native types, and a new map of Formosa.

The island is now an independent province of the Chinese Empire, the governor being directly responsible to the central government. The governor resides at Tai-pei Fu, in the north, and the island is divided into three prefectures—those of the north (Tai-pei Fu), south (Tai-nan Fu), and centre (Tai-wan Fu). The railway which was commenced some years ago with the intention of connecting the western part of the island with the port of Kelung, on the north-east, has never been actually open along its whole length, but it is being pushed towards the south, where there are prospects of a better return, and the new administration of the province is pursuing a wise and economical industrial policy.

Data are still wanting to construct a complete physical geography of the island; the composition of the high axial range which runs from north to south and culminates in Mount Sylvia (11,300 feet) and Mount Morrison (12,850 feet) is still unknown. Throughout the island there are immense carboniferous deposits. At some remote period, the plain in which Tai-pei lies was the bottom of a lake, until the pressure of the water burst the barrier of the three connected spurs of the Ta-tung Shan and Kuan-zin Shan, which rise to a height of from 1700 feet to 2800 feet. Artesian wells have been sunk in this plain to a depth of 200 feet, through strata of clay, sand, shells, and gravel. In the north-east of

the island numerous sulphur springs occur where sulphur is manufactured; on the Kelung branch of the Tamsui River there are many geysers; while in the south, coral limestone with oyster shells at an elevation of 2000 feet point to volcanic upheaval at no very distant date. The west coast of the island is fringed with mud-banks deposited by the numerous mountain streams. While the land is thus advancing seaward on the west, the east coast is rockbound, and resists the attacks of the sea.

The island, which measures about 236 miles long, and from 70 miles to 80 miles across its greatest breadth, has no large rivers except the Tamsui, in the north, at the mouth of which a sand-bar prevents large vessels from entering except at high-water. The harbour of Kelung, the north-eastern terminus of the railway, is the best in the island. Takon Harbour, in the south-west, is now silted up, and has been abandoned for An-ping, farther north, the port of Tai-nan, which, however, is liable to be swept by typhoons.

The vegetation is more markedly tropical than that on the opposite mainland, and includes plants and trees which are not found in continental China, such as the rattan and betel-nut palm. These may have been carried from the south by the Kuro Shimo (the Gulf Stream of the Pacific), which runs along the east coast. This is the more likely because the rattan also grows in Hai-nan, midway between Formosa and the Malay Archipelago, where it is indigenous. The insects, too, resemble those of Hai-nan and the Malay Archipelago, and it is possible they have been carried to Formosa by the prevailing winds.

Mr. Hosie gives an abstract of the meteorological conditions at Tamsui for each year, from 1887 to 1891. The minimum temperature recorded is 40° F. in February 1888; the maximum 100° F. in June and July 1888. The mean temperatures are not given, but the *minima* are over 60° F. from May to September each year; and the *maximum* of no month is under 71° F. The rainfall is irregular, varying 0·38 inch in June 1887, to 17·49 inches in June 1888, and 17·29 inches in September 1891. The figures do not show any regular rainy season. The total annual fall for each of the years reported on was 66·80, 75·28, 75·63, 75·34, 86·40 inches, an average rainfall for the five years of 75·9 inches.

The Chinese did not reach Formosa until after Europeans had been established as traders for some seventy years in possession. It is difficult to discover traces of the aboriginal inhabitants, but probably they were the ancestors of the "Pepohwans," or "savages of the plain," and the uncivilised savages of the mountains. These are of a Malayan type, but in many respects their appearance suggests intermixture with the people of the northern Japanese islands. The Chinese population of Formosa is between two millions and three millions, but no idea can be formed of the numbers of the savage tribes.

In a tribe visited by Mr. Hosie in 1892, on the Sintian branch of the

Tamsui River, the Japanese characteristics were very pronounced. The men were tattooed with a single vertical blue line down the middle of the forehead, and a similar line from the centre of the under lip to nearly the middle of the chin. The children were not tattooed, but the women presented a grotesque appearance, having tattooed designs on both upper and lower lips, extending across the cheeks to the ears in a narrowing blue line. The natives of Formosa were probably carried by storms from various islands of the Malay peninsula, their language showing marked Malayan affinities, and evidence of the practice of head-hunting being also forthcoming. Within the last twenty years a native of the Phillippine Islands was drifted by a storm to the north-east coast of Formosa, where he landed and settled down, thus proving the reasonableness of this process of involuntary migration.

The soil yields all sorts of vegetable crops with unparalleled profusion, and there are two harvests annually of rice and sweet potatoes, which are the chief food products. Mr. Hosie enters with some detail into the various textile, oil-producing, and medicinal plants of the island. These are very numerous, and as yet neither natives nor foreigners have taken anything like full advantage of the abundant resources which the forests afford. The main industries are tea-growing, sugar-raising, camphor and sulphur extraction. Coal exists in many parts of the island, but the coal-trade of Kelung is almost at a standstill, through the vacillating policy of the provincial government, and their scant encouragement of foreign methods. Traces of gold have been discovered at various spots, but no auriferous reefs have been as yet struck, and the gold is derived entirely from washings.

Almost the entire output of Formosa tea finds its way to the United States. More than half the sugar goes to Japan, and the rest to other Chinese ports and Hongkong. The camphor goes to Hongkong, whence it is sent to Europe. The trade of the island is capable of great development.

JOURNEY THROUGH CENTRAL MANCHURIA.

By the Rev. J. A. WYLIE.

IN the months of September and October last year (1892) I took a journey through Central Manchuria. My object in taking this journey, for which I applied for and obtained leave of absence from my station for two months, was twofold: first, to obtain a little rest from the usual routine of work, and secondly to acquire a little more knowledge of the general features of the country, and of the situation, size and relative importance of the cities and towns in that part of Manchuria. The journey lasted from September 6th until November 10th, fully nine weeks; the distance travelled was 4450 Chinese miles (or li), being equal to about 1480 English miles. The route chosen was northward through Mukden and Zielsing to Kai-Tuan, thence north-east to Kirin, thence north to Ashi Ho, eastward to Pin Chu, north-

ward to Pa Zen Su, and Pei Yuan Sin Zu (this last being my farthest point north); thence turning south-west I proceeded to Hu Lan, from Hu Lan to Shvang Cheng Pu, thence westward to Hsin Cheng (or Petuna), thence southward to Kuan Cheng Tzu and south-west to Fa Ku Men and Hsin Men Tun. From that I turned away west to Hsin Li Tun; then I took a circuitous route to Kuang Ning, visiting the small Lama Tung and the large Lama Tung (which are two important Lama temples in Mongolian territory near the Manchurian frontier); from Kuang Ning I went west to I Chu, and then south to Chin Chu; from Chin Chu, in a south-western direction, to Tien Chuang Tai; thence turning north I came back by way of Newchwang to Liao Tang.

The change of temperature experienced during the two months was most marked. When I started from Liao Tang the daily temperature was about 70° Fahr. min. and 80° Fahr. max.; when I reached Kirin I found that what clothing I had taken with me was insufficient to keep me warm, and so I had to purchase two wadded Chinese garments, and this was on September 17th. This cold weather at Kirin proved to be somewhat abnormal, for as I went further north, I found that many of the crops had been blighted by frost owing to the unusual fall of temperature. Nevertheless the weather was rather to the cold side all the time I was in these northern districts: on October 30th, at I Chu in the south, it was not much, if any, colder than on September 30th at Pei Tuan Lin Zu in the north. Only when I had crossed the River Liao, returning eastward, and had reached Newchwang did a fierce northern blast begin to blow, and then being unprepared for it, I had to go to Liao Tang, the coldest ride I have yet experienced.

The roads, so far as Manchurian roads go, were remarkably good: when I left Liao Tang they were heavy, and only slow progress could be made: but a long spell of clear bright weather soon dried them up, and long before I reached Kirin it was very fine travelling, while on the great plain north of Kirin, and again on the west side of the Sungari coming south, long stretches of smooth level ground were traversed. Only after I left Chin Chu did I experience difficulty from the state of the roads. Rain had fallen very heavily on two successive nights and during part of the intervening day, and had made the ditches and pools of that low-lying district, at all times numerous and deep, more numerous and deeper still. Our progress for several days at that time was very slow; at times every carter would stand still for half an hour before venturing into a pool or ditch: several times we had to risk being the first to cross: while for two successive days, and for hours at a time, and that chiefly in the early hours of the morning before dawn, the clogging of the axle and wheels of the cart with the thick mud necessitated a stoppage every three or four minutes that the carter might put them right.

As my time was limited, and as my purpose was to get over a good deal of ground in that limited time, I did not delay in any of the cities or towns. With the exception of Kirin and Chin Chu I did not wait anywhere longer than a day. My usual practice was to make a circuit of each place either outside or inside (or partly outside and partly inside) of the walls, and to ride through several of the principal streets. This gave me a very fair idea of the extent of any town or city and of its general appearance, as well as of what constituted its principal industries.

The chief crops in the districts through which I went were the tall millet, four kinds of which are cultivated, the small millet, three kinds of which are cultivated, beans of several kinds, hemp of two kinds, cotton in parts south of Kai Yuan, rice chiefly south of Kai Yuan, potatoes more cultivated in the north and to the west of the Sungari. Indigo, wheat, barley, and opium are largely grown, but the ingathering of these for the year was over: the great extent to which flour is used and its unusual cheapness testified to the large cultivation of wheat. The hemp chiefly

grown is the slender variety, the "linen ma," and of this we saw in many places large fields one after the other: it is grown principally for the sake of the oil expressed from the seeds.

The cities and towns I visited were centres of trade for the surrounding country; many of them could boast of very large distilleries, inn-yards of great extent capable of accommodating hundreds of guests, and oil-works of various kinds; while outside their walls were generally some brick-kilns, brick-works and lime-kilns. The houses were chiefly built of brick; burnt brick was used for the better houses in the town, while unburned brick or mud only was used in the country. In some of the cities the shop-fronts were quite imposing, being substantially built and lavishly decorated. The streets generally were wide and level. I saw nothing of the immense activity which characterises these cities during the winter months, when all the inns are full and the shops doing a good trade, when from the south come great numbers of men seeking employment, and the rush of men and the succession of carts is continuous. The streets were only moderately busy, the inns were almost deserted; it was evidently only a "waiting" season. And as in the cities there was no stir, so neither was there stir in the country, at least on the roads. There was moreover, nothing of goods traffic by means of large carts, and very little by means of small carts: more than half of the large inns open in the winter had closed doors for the summer, and at times this gave one the impression of deserted villages.

The scenery was varied: at first we had well-wooded hilly country, with mountains to the east; north of Kirin it became less hilly but still undulating, enabling one at times to get a magnificent view of the vast plain. North of Ashi-Ho the plain got very monotonous; round by Hu-Lan, Pei Tuan Liu Tzu, Shvang Cheng Pu, Petuna, was only the dead level plain: fine open country, it is true, but no prominent objects making a near or distant horizon. The Mongolian plain south of Petuna was more undulating, while south of Kuan Cheng Tzu, we came again to the well-wooded regions. In the parts round Kuang Ning I Chu and Chin Chu we have light soil, and vast sandy wastes, but volcanic rocks, and ranges of hills and mountains give beauty and grandeur to the country. It did not fail to me to see the beautiful scenery on the banks of the northern Sungari; that beautiful scenery must be farther down the river. The northern Sungari where I crossed it had no high banks, and the trees on either side of it were by no means plentiful or umbrageous. It is the southern Sungari at or near Kirin that flows through a finely-wooded country, with hills in all directions. At Kirin the views on both sides of the river were very picturesque: on the south of the river were parks well studded with trees, with hills in the distance; while north of the river were the piles of timber (so prominent a feature of Kirin) and the city itself in the foreground, and beautiful hills with temples situated in romantic dells in the background. The houses by the river-side rest on little perpendicularly placed blocks of wood, as indeed do also some of the streets, while nearly all the houses are more or less built of wood, and the streets are laid with wood. The walls of Kirin are only 9 or 10 feet high, of no use for purposes of defence. The city inside the walls has a reputation for extraordinary filth, but concerning this I can bear no trustworthy testimony, because the soil was then dry, and stagnant water was not common. Only in two or three places did I notice what might be called cesspools. The Kirin streets are narrow, and so blocks of traffic must be frequent.

About 55 li west of Kirin on the road from Mukden, as well as on the road from Kuan Cheng Tzu, is the village of Ta Shin Ho, where Dr. Greig was attacked the year before last. I took a mid-day meal at the inn where that sad incident occurred: on entering the inn-yard, I heard one or two boys saying that I was

Dr. Greig, but when I went into the room, they soon found out that they had been mistaken. The inn-people were most friendly, and they evidently regretted that there had been such an occurrence as above referred to in their inn at all.

On the same day as that on which I was at Ta Shin Ho, indeed only shortly after leaving that village, I came to the Lao Te Ling, a charming place: the hill was steep, but at every turn of the road, there was something beautiful met the eyes. At the summit there are several fine temples, including one, a large Buddhist temple, in course of erection; and in connection with this there is an interesting story. In a little house with 8 feet by 6 feet of accommodation, two-thirds of which is occupied by a small Kang, there lives a Buddhist priest. His head is not close-shaven, as the heads of other Buddhist priests are, for since taking up his residence in these quarters, or rather in this sentry-box, he has allowed his locks to grow. For four years has he already been here, and another three years at least remain for him to stay. He is seeking to attain perfection, and he must finish what he has begun. Not until the temple is finished building will he be at liberty to leave his post.

The little door of this priest's domicile is sealed up, so he never even steps out into the open air; there is only a small opening in the door or window for an attendant to hand in his meals. These meals are scanty and few: only one meal a day at noon. He drinks great quantities of tea, however: he seems to put no limit to his indulgence in that beverage. In sleep he does not stretch himself out: in fact he never lies down, he only half-reclines, and asleep or awake, he constantly keeps pulling away at a rope which connects with the temple bell, which must never cease to ring. Travellers passing at all hours may hear the bell sounding; this is part of his work of merit.

While I was with him, even although we spoke in such a way that everything else might be forgotten, he did not forget to pull the rope. How, during sleep, he manages is to me the mystery. He had heard long ago of the Christian religion; some books I offered him he refused on the ground that before he had purified himself by completing his task, it would be sacrilege to touch these books. When I pressed him he accepted them, however; how earnest must this man be when he thus denies himself; still it is merit, and merit for himself that he is endeavouring to attain.

Entering Kirin I saw a ghastly exhibition; two days previously more than forty men had been executed publicly, and their heads were now hanging up on trees in a park, specially used for that purpose, on the right-hand side of the road. This was the other side of human life from that seen in the Lao Te Ling priest.

At Hsin Cheng I had a new experience; there I first saw the Mongols in considerable numbers. Crossing the ferry from Hsin Cheng to Mongolia we were thrown a long time on each other's company. Many of them speak two languages: for the purposes of trade they require to know Chinese. They are freer in some ways than the Chinese; there is not so sharp a distinction of classes; literary men and magistrates often engage in business, so do the Lamas. The magistrates wear very large fancy hats, which get very shabby-looking in the case of those who do buying and selling as ordinary merchants. Many Mongol priests were to be seen with their yellow and purple garments. They were very energetic and bright. The Mongols as a race, as is well known, are given much to the rearing of cattle, especially horses. Packs of horses were constantly overtaking me from the west and north-west while I was going south. On several occasions I stayed for the night in an inn kept by Mongol proprietors; on these occasions I noticed that the Mongols were greatly given to gambling: all night long did they continue card-playing with their cash beside them.

The Lama temples were interesting. South of Hsin Cheng (80 li) we came to the first one; it was situated at a distance of 6 li from the main road, and being built on an eminence and gorgeously decorated with golden colours, glistening in the sun in fine contrast with the red and white wash, it presented a striking effect. It comprised three separate blocks of buildings of two storeys each; it was only when one stood actually at their base that the grandeur of the structures became somewhat less in one's eyes. Each erection had eighty-two small "chien," in addition to a tower of moderate height. I could not induce any of the priests, superiors or inferiors, to open the temple doors to show me the interior. "The key was in the possession of the custodian, who had gone away to a neighbouring village for half the day." Eight li south of this place was the residence of the Mongol prince of that part of Mongolia; it was beautifully situated in a finely wooded glade. The prince's residence was in external appearance just like a rich Chinese landlord's. On each side were the houses of his retainers. The Mongol land is more or less reserved for the Mongols: only under certain strict regulations are Chinese allowed to purchase or mortgage. Several years ago when purchase was made easier for a time a good deal of land was bought by Chinamen.

At a village called Huo Shih Ling Zu, 180 li north of Kuan Cheng Zu, we were near the native home of the Manchurian lark. Even at that village the birds brought a good price. Of other Lama temples that I came to was one, 120 li south of Mai-Mai-Kai, at a place called Ka Hsia, where are eighty priests. But the great district for these Lama temples is more to the south-west, near Hsia Li Zun, immediately outside the boundaries of Manchuria. They are all built in the same style, washed with red and white lime, each structure having eighty-two chien, but in connection with one establishment there being often many buildings. Strange to say at Hsin Li Zun, only 70 li distant from one of the principal groups, I could gain no authentic information anent that group. Only one man out of all whom I met and enquired of in the inn had traversed the road which passes near these temples. I had to enquire the way as I went forward every 10 or 20 li. From Hsin Li Zun I went north-west to Ma Ling Zu (10 li): there I inquired, and then made for Lu Li Cho, north-north-west, 15 li. After taking some lunch at a small inn there I started for the small Lama Tung temple, 5 li off. From the small Lama Tung I made for an inn 25 li to the south, viz., at Yang Ke Tun, and there I arranged with the innkeeper as to what should be done when my cart came, and also left instructions as to the movements of the cart in the event of my not coming back to the inn that night. Thereupon I set out for a large temple which was said to be 20 li off, but which I found to be 30 li.

I reached this temple, called the Ta Lama Tung, at five in the twilight. Long before reaching the Tung, or the settlement, for such it was, I saw the buildings glistening in the setting sun on the slope of the hills. In the far distance it seemed like a fishing-village at home, the hillside dotted with white spots, larger and smaller, at unequal distances from each other. The large buildings (or temple precincts proper) were painted white in their lower storeys and red in their upper storeys. When my approach was observed as I slowly led my pony up the steep hill, about four hundred Lamas crowded about me. These Lamas were very inquisitive to know what was in my pockets. I answered their questions in a way more or less satisfactory to them. Having talked a good while with them, the darkness coming on, I asked if I could be accommodated in some of their houses for the night, as there was a distance of 30 li to my inn, and the road was very bad. They could not entertain any idea like that of my staying there for the night. They made various objections, amongst others saying, What if my horse was lost? There is no yard in which to tie him

up. At last, after many endeavours, I began to think that they could not be induced to change their attitude, so I began slowly to move away, intending to go back through the darkness to the inn at Yang Ke Tun. As I descended the hill, however, one of the priests who had been at first most opposed to my staying was suddenly influenced to take a different view of the situation, and began urgently to invite me to stay in his compound for the night. I hesitated, and asked him the reason of his new move. When we had gone a little farther we met another priest, and him this priest urged to invite me to his house. He did so, and stated at the same time that he had a compound where my horse could be attended to. This invitation I accepted, and he led me to a very good compound, which turned out to be not that of the man who gave me the invitation but that of the treasurer of the temple funds and manager of the commissariat department, by name Wu. He had several horses of his own in his yard, which were well-fed and attended to. His house was a good one, the guest-room being very neat and clean. A great number of priests, young and old, followed me into his house. Mr. Wu bade his attendants bring me food, and I fared very well indeed. Among other things black tea was presented, the Mongols using the black tea, and not the green tea of the Chinese. We had a good hour's talk together; he was a very pleasant companion in conversation, but was rather unpleasantly forward in his way of handling one's personal belongings. My riding-whip he wished to keep in exchange for one of his own, which he straightway brought into the room for that purpose. My watch he was very anxious to possess as a "keepsake" from me. And so with some other things. In fact it was with the utmost difficulty I could get him to give up his pursuit of these objects: at last I had practically to say "hands off."

My resting-place for the night was not the most pleasant: it was at the cold end of a kang on which were many Lamas of inferior rank. Had the Lamas in these temple grounds any idea of doing injury to me or robbing me of anything, that night was their opportunity. Next morning my host, according to promise made the previous night, sent a little boy to lead me to one of the halls where they were chanting. In all there were seventy priests chanting at that service besides some acting as attendants. They chanted in rather an orotund voice, not at all in the falsetto of the Buddhist priests I had previously heard. Those attending were very careful to see that I did not cross the threshold of their temple, but from the door I saw and heard everything that was going on. Their service lasted for about three quarters of an hour. After the chanting I was invited by another Lama to go to his house and have breakfast. I accepted his invitation, and afterwards started on horseback for the inn I had left the previous afternoon. The Ta Lama Tung has at least one thousand five hundred priests. One hundred li west of it is the Fo Lama Shihi with four thousand priests.

I had one very hard day's ride. This was from Kuang Ning to I Chou. I started at midnight going south-west down the imperial road for 40 li in the dark. Oftentimes I lost the track and directed my course by a star. Having gone these 40 li my route lay over the hills, but shortly after leaving the highway I lost my road; clouds had arisen, I had no sun and no star to direct my course, and backward more or less I went for 15 li. I stopped at an inn or two for food, but either no food was to be got or the crowds of curious onlookers were too many, so (with all good wishes to these crowds of onlookers, for it was a beautiful morning after the sun rose and the pleasant company of some wayfarers I met made me enjoy the journey) I went on and on until at twelve o'clock I found an inn where they soon prepared food, having had a ride almost continuously from midnight until noon, and gone 115 li. Afterwards I went 35 li into I Chu, 150 in all that day. The following day I had about 100 li to Chin Chu.

Let me add a few remarks in reference to the towns visited:—

Kai Tuan is rather a busy place: it boasts of a pagoda of a good height. Our preaching-chapel is well-situated on the east street.

I Tung Chu is a large village, or small town, 280 li south of Kirin.

Of Kirin I have already spoken. In that city not far from the governor's residence is the dispensary opened by Dr. Young last spring.

Two hundred and sixty li north of Kirin is a large village called Ku I Shu, where is an out-station of the Irish Mission.

One hundred and thirty li still farther north, is La Lin Tsang, a very busy market town, situated near the La Lin River.

Going another 40 li we came to Ashi Ho. This town has mud walls: is rather irregularly laid out but has a fair amount of business.

Pin Chu, 130 li east has also mud walls: in addition its walls have a parapet of brick. Ground is more plentiful in this town, and so large compounds are to be seen in it mostly those of distilleries. The east part of the town is on the slope of a hill, and so from the east wall a fine view can be obtained of the town and the surrounding country. To the immediate east are hills of some size.

One hundred li to the north is Pa Yen Su, a larger place than Pin Chu, but much like it in general characteristics.

One hundred and eighty li farther north (less as the crow flies) is Pei Tuan Lin Zu, still larger than Pa Yen Su. This town has a mud wall like the others: it lies on a wide open plain. Its streets are broad and are ornamented with some fine pawn-shops and other imposing frontages.

One hundred and seventy li south-south-west of Pei Lin Zu, and more than 100 li west of Pa Yen Su, is Hu Lan. This town has no walls; consists chiefly of one main street, which boasts of a large market-place and large shops gorgeously decorated not a few. The ferry over the Hu Lan River just at the south end of the town is a very busy institution.

One hundred and fifty-five li by road south-west of Hu Lan on the south of the Sungari and 130 li west of Ashi Ho, is situated Shuang Cheng Pu. This town encloses within its walls a larger area than any of the northern towns previously mentioned; it too has mud walls: both inside and outside the walls the ground is very level, so that there is no possibility of a natural drainage of the water. The moat outside contains only stagnant water. The main streets are wide, the cross is very busy: the inns are numerous and remarkably large.

Hsin Cheng or Petuna (the proper Petuna is 30 li further north), is 260 li west of Shuang Cheng Pu. On the south and on the west of it flows the River Sungari, which is there very wide but shallow. Two ferry-boats ply, one belonging to the Chinese magistrate and one belonging to some Mongols. Each boat makes one run hither and thither in the day. At Petuna there is evidently a large trade carried on between the Chinese and the Mongols. Its walls are low and very irregularly built.

Kuan Cheng Tzu is situated 240 li to the west of Kirin and 345 li south of Petuna: it is a very busy place: there is one large north and south street, and several large east and west streets, the first east and west street being close to the southern wall, the second parallel to this, but farther north, and similarly with the third and the fourth. On the north and south street, and on the first east and west street, are very large shops, and altogether a large business must be carried on. The south gate is a busy market-place. The other streets are rather irregularly laid out, and the walls round the town are quite unworthy of the name of walls, being of mud, running in no regular direction, and in many places presenting large gaps. At

Kuan Cheng Zu are the residences of the Irish missionaries, Mr. Carson and Dr. Greig,

About 80 li south of Kuan Cheng Zu is the watershed of the rivers flowing north and those flowing south. Within a radius of 200 li of Kuan Cheng are some of the largest and best-equipped Chinese inns I have seen; had I kept to the main highway going, I would have seen more of these fine inns.

Fully 300 li south-west of Kuan Cheng Zu, is Mai Mai Kai, a busy place but of no pretensions otherwise. It has four principal streets, a north, a south, an east, and a west street, which together form a square; the north street forming the northern side of the square, the south the southern side, and so with the eastern and the western. Mission-work goes on quietly.

Fa Ku Men is about 500 li south-west of Kuan Cheng Zu; if Kuan Cheng Zu is irregularly laid out, Fa Ku Men is still more so. It is situated on somewhat of a hill, and has no walls, except at its northern end, where is the boundary gate into the Mongolia territory, and where custom is levied. It has two main streets, both of which run north and south; these streets are rather narrow. The Irish mission have a chapel here, situated in a most desirable place.

One hundred and sixty li south-south-west of Fu Ku Men, and at an equal distance west of Mukden, is Hsin Men Tun. This town has one large central east and west street 10 li long, and two small streets running parallel, one on each side, to the large street. It has a good trade and would be a most prosperous place, were it not for the fact that the surrounding country is year after year flooded by the Liao River, and the crops are ruined, and the farmsteads washed away. Last year a large district was washed by these floods, and many families reduced to absolute poverty, while others suffered greater loss. A better situation for a chapel could hardly be than that chosen by the Irish mission in Hsin Men Tun.

Hsin Li Tun is a small but important place west-north-west of Hsin Men Tun. The people there were not very courteous in their treatment of guests, shouting, reviling, and throwing mud when one appeared on the streets.

About 120 li south of Hsin Li Tun is Kvang Ning: it is fairly busy in its main street, but otherwise had a leisurely appearance. Within the city walls to the north-east is an eminence on which is built a very fine temple (a Niang Niang temple), while outside, at no great distance, is a peculiar rectangular hill, on which is also erected a temple, in red sandstone, of very picturesque appearance. Not far from the Nath gate, within the walls, is a double pagoda, not high but in good repair.

On the other side of the high range of hills, to the west of Kvang Ning, is I Chu. This is not a very busy place, the shops being small, and the streets irregularly laid out; it has a very high pagoda.

Ninety li south is Chin Chu; it is a compactly built town, with narrow streets and high walls. Its area is much less than Liao Tang, but what area it has is more densely populated. But to my mind it cannot have so large a population as Liao Tang. Its pagoda is a prominent object, being seen at a great distance off. About 20 li from the city you reach the base of high hills. The mission buildings, though situated on a space of ground between two comparatively quiet streets, are yet at one point within 100 yards of the great street leading to the east gate.

About 200 li south-west of Chin Chu is Tien Chwang Tai on the right bank of the Liao. Formerly this place was the port for the interior, before Ying Kov took its place as such. Much native craft still comes here.

The town of Newchwang is Goli, north-east of Ying Kov. It is a poor-looking

place, has a low mud wall enclosing a few houses; but outside the wall is the real Newchwang, which is by no means large. The principal object in the landscape is the tower of the Roman Catholic church. The Roman Catholics have many mission stations scattered here and there over Manchuria. To the east of Ashi Ho between Ashi Ho and Pin Chu, at Pa Ya Su and Pei Tuan Lin Zu, they have establishments, between Petuna and Kuan Cheng Zu they have one or two stations, and again south of Fa Ku Men, several stations in their country districts.

HAUSA PILGRIMAGES FROM THE WESTERN SUDAN, TOGETHER WITH A NATIVE ACCOUNT OF THE DEATH OF GENERAL GORDON.*

By the Rev. C. H. ROBINSON, M.A.

MR. ROBINSON said there were not improbably some present to whom the word Hausa, whether as applied to a people or to a language, conveyed but very little distinct meaning. They would, therefore, be surprised to hear that Hausa might claim to be the second most widely-spoken language in Africa, being spoken, in fact, by no less than fifteen million people, *i.e.*, by one per cent. of the whole human race. The comparative neglect with which both the Hausa language and people had been treated in the past, as well as the immense influence which they seemed destined to exert upon the future of Central Africa, must be his excuse for consenting to read a paper after such a very brief study as he had as yet been able to make in Africa, whether of the people or of their language.

Before passing to the more direct subject of this paper, he might, perhaps, pause for a moment to remind them of the exact locality and extent of the country inhabited by the Hausa people. Besides being, as it was, a sort of *lingua franca* throughout the whole of the western and central Sudan, being understood sufficiently for purposes of trade and travel from the Niger and Binue to the Mediterranean, and from the Gulf of Guinea to Khartum, it was the distinctive language of the Hausa race proper inhabiting the country which stretched from a little above the junction of the Niger and Binue to the south border of the Great Sahara. As compared with the tribes by which they were surrounded, the Hausas were a highly-civilised race. Living in strong, well-built cities, they manufactured large quantities of native cloth, leather, paper, shoes, etc., which, together with palm-oil and spice, formed the staple articles of the trade which they carried on throughout the whole of the Sudan. Small outlying colonies of Hausa people were to be found in Alexandria, Tripoli, Tunis, and almost all the towns on the African coast of the Mediterranean.

The language spoken by the Hausa people, which possessed an alphabet and a literature of its own, the alphabet being a modification of the Arabic, was radically distinct from the other native languages by which it was surrounded. It resembled Coptic from the fact that whilst being itself probably non-Semitic, it had borrowed its whole pronominal system, and a large part of its general structure, from a clearly Semitic source.

It was during the course of a journey, from which he had recently returned, along part of the southern frontier of Tunis and Algiers, near the northern border of the Great Sahara Desert, that his attention was directed to the subject on which he had been asked to read the present paper. It was difficult to over-estimate the far-

* Paper read at the Nottingham meeting of the British Association, September, 1893

reaching results, on the life and habits of the great Hausa race, of the command addressed by the Prophet in the Koran to all his devout followers to make the pilgrimage to Mekka. The efforts which were constantly being made by tens of thousands of the population to fulfil this supposed obligation produced a sort of arterial circulation throughout the whole of the Sudan, starting in some instances from places as much as 3000 miles distant from Mekka.

During the course of the journey above referred to, a journey which he made for the purpose of ascertaining by direct intercourse with the natives the possibility of crossing the great Sahara in order to reach the Hausa States which lie to the south of it, Mr. Robinson had with him as servants and camel drivers two Hajis, namely, men who had successfully accomplished the pilgrimage to Mekka, both of whom were Hausas. The story of his life, which the father of one of these Hajis, himself a Haji, dictated to him in Hausa, might, perhaps, prove interesting as illustrating the difficulties and adventures which the pilgrims not unfrequently met with in the course of their protracted journeys.

The author, Abu Bekr by name, a native of Bida, a town of about fifty thousand inhabitants, 150 miles north-west of Lokoja on the River Niger, set out with several of the members of his family, a party of seventeen in all, and proceeded, in the first instance, to Kuka, on Lake Chad, whence, after a stay, or rather detention, of four months, he set out, *viâ* Wadai and Darfur for Khartum. Whilst passing through Wadai, he and his party were captured and treated as slaves for about a year; but having eventually regained their liberty and part of their property, on the plea that they were pilgrims bound for Mekka, they at length reached Kkartum, or rather Omdurman, opposite Khartum, shortly after the taking of the city and the death of General Gordon.

The following is a literal translation of the account which Abu Bekr gave of the taking of the city and the death of Gordon, being the version current in the Mahdi's camp. It differed, as would be seen, in one or two important details from the accounts hitherto published, especially with regard to the amount of resistance which was encountered by the Mahdi immediately prior to the taking of the city. The translation, as they would see, was rough, his object being to preserve the idiomatic expressions of the original.

"On the day of the taking of the city, fighting went on from early morning until evening without ceasing. Many of the Pasha's men were killed, and many of the Mahdi's men were killed, until the evening came, till late at night. As the Pasha's men were resting, some of them went to the place of the Mahdi. They said to him, 'We are tired, we have had no rest to-day; do you give us something to eat; if, then, you will come to the place where we are in the evening, the Pasha, he will run away.' The Mahdi said, 'It is well, but how shall we take the place?' They said, 'Only come and fight.' The Mahdi gave them goods. He said, 'Stay in my camp if you will, or go to your own place.' They rejoiced; he gave them a cow, it was killed for eating; he gave them a camel, it was killed for eating; he gave them much money. He said, 'It is well; he (*i.e.* the Pasha) shall not sleep before we take the city, by the help of God.' Then he arose in the early dawn. He took soldiers. They went to the east of Khartum. They sat down there. Others, they went to the north; they sat down there. Others went down near the river; they sat down there. The Mahdi himself, he went towards the south. He rose up, a drum was beaten, a trumpet was blown; they all then arose and went towards Khartum; the men of Khartum, they rose up, a fight began, this man and that man each fired his gun, they fought until the evening, but they were not able to enter into the town; in the evening they ran away. Many of the Mahdi's men were killed. The Mahdi rose up. Three times

he exclaimed, 'O God, O God, come!' He uttered many charms; he prostrated himself twice. All his men saw this; the fight went on till the early dawn. In the darkness the Mahdi entered into the city; no one saw him. When the men of the city saw him, they said to the Pasha, 'The Mahdi, he has entered into the city.' The Pasha said, 'Where is he?' The Pasha's men, when they heard it their hearts fell within them; they threw away their guns. About twenty men were caught; they fell down, they died. One was cut, another pierced with a spear. He did not see who it was who pierced him. Some men were seen up above; fire was seen in the place, the men of the city they all ran away. The Pasha, he said he would not run away till he was captured. He was struck with a gun; he was pierced with a sword and a spear; he was struck with a stone. The Mahdi had said, 'He must not be killed, he must be brought before me; men do not kill a king in war.' When the Pasha said he would not go to the place of the Mahdi, all the Mahdi's men struck him. The Mahdi, when he heard it, said, 'Let his head be brought.' It was cut off, his body was thrown into the river. When his head was brought to the place of the Mahdi he said, 'Close his eyes.' He said, 'You have done a wicked thing; why did you kill him?' He was angry; he rose up, he returned to his camp in the evening."

Abu Bekr, after with difficulty escaping from the camp of the Mahdi, who wished to detain him as a soldier, proceeded on his journey to Mekka, through Abyssinia, where he was detained for a whole year, arriving at length at Sawakin. From Sawakin he went by steamer to Jidda, and thence by land to Mekka. Having performed the rites of the pilgrimage, which occupied a month, he found himself without any resources wherewith to continue his journey. He was consequently compelled to remain for four years at Mekka, at the end of which time, having replenished his own resources from those of subsequent pilgrims, he returned to Jidda, and went by steamer to Suez. From thence he walked to Alexandria, and came by ship to Tripoli. Having spent some considerable time in collecting money, chiefly by the sale of charms, to enable him to continue his journey once more, he has just now started with those who still remain of his original party to complete his return journey to Bida by crossing the Great Sahara Desert, a distance of somewhat more than 2000 miles. Should he meet with no unforeseen obstacles, he should reach his home in about a year's time, and will then have completed a journey of nearly 7000 miles, chiefly on foot, in about nine years.

The above story was only one of several which Mr. Robinson had himself met with, and might be paralleled by hundreds of others more or less similar. His purpose in giving it thus in detail was to afford an illustration taken, so to speak, from life, of the important part which these pilgrimages to Mekka from all parts of Central Africa, and more especially from the Hausa States, had played in the past, and were destined to play in the future in the history and perhaps gradual civilisation of the people concerned.

The chief object of Mr. Robinson's recent journey in North Africa had been to ascertain the possibility of crossing the Great Sahara Desert from the north in order to reach the Hausa States, which lie to the south of it. The two possible routes by which such a journey might be attempted start, the one from Tripoli, and the other from Tunis. The former is at present closed to Europeans by the persistent refusal of the Turkish authorities to allow anyone to penetrate inland to a distance of more than 10 miles from the town of Tripoli. The second, since the massacre of the Flatters expedition by the Tuaregs, is scarcely more practicable. Mr. Robinson is accordingly proposing to go out to the River Niger, and after ascending this river as far as Lokoja, to start thence overland to Kano and Kachina, two of the principal towns of the Hausa States, the former, according to native accounts, containing a

population of one hundred and twenty thousand. After spending a few months at each of these places, he would hope to go on still further to the north, and, crossing the Great Sahara, to arrive at length at Tripoli, the distance in all from the mouth of the River Niger to Tripoli being about 2600 miles. The exact journey which it is thus proposed to attempt, does not appear to have been made by any European traveller, though the northern portion of the route, *i.e.* from Tripoli to the neighbourhood of Kano, has been traversed at least three times within comparatively recent years, *viz.*, by Dr. Barth, 1850-55, by Dr. Nachtigal, 1868-73, and quite recently in the reverse direction by Captain Monteil, the two former being of German and the latter of French nationality. One of the principal objects of the proposed expedition will be the collection of specimens of native Hausa literature and the study of the dialectical differences existing in this language with a view to the eventual publication of the New Testament. The Hausa tribes profess the Mohammedan faith, which has been outwardly imposed upon them by conquest, but they are for the most part entirely free from the bigotry and fanaticism which characterise the East Sudan. Moreover, their great eagerness to become possessed of books, a man's wealth in some parts being reckoned by the number of books he possesses, renders it probable that if the New Testament could be produced in a form exactly similar to their own books, printed perhaps on their own paper, it would at once obtain a circulation by means of the native caravans throughout a great part of the Western Sudan. While this is one of the objects contemplated as the result of Mr. Robinson's expedition, he will be prepared to observe the country in which he will be placed, as well as the people who inhabit it; so that his scientific results are likely to be of some importance.

The Hausa Association,* for which Mr. Robinson is going out, has issued an appeal for £1600, the estimated cost of the proposed expedition, of which, up to the present time, only £800 has been as yet received.

THE MONTHLY RECORD.

THE SOCIETY.

The New Session.—The Session of 1893-4 will be opened on Monday, November 13th, when the President, Mr. Clements R. Markham, C.B., F.R.S., will give an address on what remains to be done before the Earth is completely explored, and on some of the great geographical problems that still remain to be solved. The second night of the session will be devoted to the subject of Antarctic Exploration, when Dr. John Murray will read a paper indicating what is our present knowledge of the region and the best method to be pursued in order to increase that knowledge. It is hoped that a thorough discussion of the whole subject will follow. Several other important papers are in hand or have been promised; one of the most interesting of these will be Dr. J. W. Gregory's

* The Hon. Sec. of the Hausa Association, Rev. J. O. Murray, Emmanuel College, Cambridge, would be pleased to forward to members of the Royal Geographical Society further information in regard to the proposed expedition, or to receive any contributions towards the same.

account of his adventurous journey of exploration to the glaciers of Mount Kenia, from which he has just returned. The other subjects likely to be brought before the Society during the session will be seen from the programme which accompanies this number of the *Journal*.

Mr. Mackinder's Lecture on Geography and History.—Mr. H. J. Mackinder will give the second course of his series of lectures on the relation of Geography to History, early in the new year, beginning on the second Friday of January (the 12th). The general subject and the titles of the various lectures will be found on the programme accompanying this number.

Dr. Mill's Lectures on Geography and Commerce.—On Tuesday evening, October 3rd, the second course of the Society's Educational Lectures was commenced in the theatre of the London Institution, Finsbury Circus, E.C. Mr. Clements R. Markham, C.B., F.R.S., President of the Society, in a few words expressed the hope that the new departure of the Society in providing a course of lectures on the principles of Commercial Geography in the City would be justified by its success, and introduced the lecturer, Dr. H. R. Mill. The attendance was very good, and has been maintained at the subsequent lectures. The first lecture was introductory to the course, and dealt with the definition of Commercial Geography and the share of Commerce in promoting geographical discovery. Geography as a whole was compared to a pyramid of six courses of masonry, built of blocks obtained from different quarries. The first and fundamental course, built of material derived from pure mathematics, was mathematical geography, absolutely secure and firmly established, underlying all the rest. Upon it, and resting on it, rose Physical Geography, the material for which was brought from physics, geology, meteorology, etc., all the determining conditions being fully known. This served as a foundation for Biological Geography, in which the imperfect comprehension of life introduced unstable and incomplete elements; but far fuller of uncertainty was the next tier of Anthro-po-geography, in which the additional unknown quantity of human nature exercised a preponderating influence, and the positive scientific facts from the quarries of anthropology, ethnology, and economics were few and by no means well coordinated. Arising from this came the layer of Political Geography, the scientific basis of which was mixed up and overlaid with arbitrary, transitory, and unpredictable conditions arising from the workings of the human mind and the limitations of nationality. Upon this was reared the final storey of the pyramid, Commercial Geography, a mass of rubble, the relation of which to its scientific foundation is as yet by no means fully made out. Here individual self-seeking is superimposed on national exclusiveness, and the limits imposed by tariffs, customs, monopolies, competition and the like are in a continual state of flux. The object of the first

part of the course of lectures was to define the principles of geography, or the relations between the various elements of which the science as a whole is composed, with special reference to its commercial aspect. The second part of the course was designed to illustrate the application of geographical principles to specially-selected divisions of the British Empire. The stimuli to exploration by natural conditions compelling migration, by political aggrandisement, commerce, religious propaganda and scientific research were referred to, and an outline of the history of discovery was sketched, in order to show how large an influence commerce had in starting the great wave of discovery from the Mediterranean centre, which spread round the globe in the sixteenth century and revealed the true form and actual parts of the World. The state of our present knowledge of the Earth's surface was illustrated by a chart showing the degree of accuracy with which maps of the various regions could be drawn from existing surveys.

The Society's Educational Prizes.—The Council resolved last session to place the Scottish and Irish Training Colleges on the same footing as those of England. The arrangement with the Scottish Education Department has been completed. To suit the conditions of the examinations in Scotland, it was arranged to award the prizes on the basis of the paper in geography, set to pupil teachers and others who should be candidates for admission to the training colleges. The following names have been forwarded by the Scottish Educational Department as those of the candidates who stood highest in the examination of Midsummer last. Males:—1. Thomas W. Death, of Ferryport-on-Craig Public School; 2. Frank Duncanson, of Burntisland Burgh School, and Alexander Sinton of Govan, Stewartville Public School; 3. William R. McGregor of Aberdeen, Frederick Street Public School, and William McC. Wightman of Kirkbean Public School. Females:—1. Mary J. Milne of Aberdeen C. S. Practising School, and Jane McDermott, not attached to any school; 2. Jeannie Cooper of Glasgow, Camlachie Public School, and Thomasine M. Park of Leith, St. Thomas's Public School; 3. Nellie Smith, of Aberdeen Free Church Normal School.

Orthography of Geographical Names.—A new edition of the Society's system of orthography of geographical names has been issued. The last edition was published in the *Proceedings* for February, 1892. The following rules have been added to those which are given there. "7. In the case of native names in countries under the dominion of other European Powers in whose maps, charts, etc., the spelling is given according to the system adopted by that Power, such orthography should be as a rule disregarded, and the names spelt according to the British system, in order that the proper pronunciation may be approximately known. Exceptions should be in cases where the spelling has become by custom fixed, and occasionally it may be desirable to give

both forms. 8. Generic geographical terms, *e.g.* those for Island, River, Mountain, etc., should be as a rule given in the native form. In the case of European countries, translation into English, where this has been the custom, should be retained, *e.g.* Cape Ortegal, not Cabo Ortegal, River Seine, not Fleuve Seine. N.B.—On any printed map or MS. document an explanatory table, giving the English equivalents of the generic terms used, should of necessity be inserted." There have been one or two slight changes in the list of examples. Copies of the circular may be obtained by application to the Secretary.

EUROPE.

Distribution of Population in Sicily.—In commenting on an investigation into this subject by O. Marinelli, Dr. Theobald Fischer adds (*Petermanns Mittheilungen*, 1893, No. 8) some interesting remarks of his own on the causes of the existing facts of distribution in Sicily. Dividing the island into the three slopes facing respectively the three adjacent seas, Marinelli determined the population of successive zones of altitude in each. In all three the steep ascent from the coast strip to the tablelands above is marked by a scanty population, but the remarkable fact is, that while on the other two slopes the greatest density is found on the coast, on the African it occurs entirely above 1300 feet. This is attributed by Marinelli to the influence of malaria and the unsettled state of the country during the Middle Ages, when the population was driven inland. Fischer, however, thinks that still more is due to the natural characteristics of the coast. The steep cliff of tertiary strata, almost without indentations, exposed to the full force of the sirocco and liable to constant landslips, affords no natural harbours. The rainfall is small and springs scanty, and the principal streams (even when not brackish) are nearly dry in summer, affording no facilities for irrigation, while the extent of level ground for cultivation is small. Nor were suitable sites present for strongholds against the attacks of pirates from the African coast. The south of Sicily has long suffered from the want of a civilised coast confronting it, and now that progress has again set in in Tunis it is France that reaps the benefit. Population is more and more attracted to the face turned towards Italy, as it was in old times to the Grecian, and during the Arab epoch to the African, side.

Dr. Radde's Journey in the Kuban District.—We hear from this indefatigable explorer that he has lately returned to Tiflis from a four months' journey, in which, after visiting the whole eastern shore of the Black Sea northward as far as the Kuban district, he struck inland and crossed the mountains from the valley of the Little Laba to the sources of the Msinta. In this journey he was able to define the habitat of the aurochs, the fresh tracks of which he himself saw. The results of the journey are shortly to appear as a supplementary number of *Petermanns Mittheilungen*, which will be accompanied by a map showing the localities in which the aurochs is still found.

ASIA.

Mr. Theodore Bent's Expedition to Hadramaut.—In the latter part of November Mr. Theodore Bent proposes to leave for Aden in order to proceed into the interior of Hadramaut in Southern Arabia, for the purpose of exploring a country of great interest, but of which our knowledge is scanty. Mr. Bent himself will attend mainly to the general geographical features of the country as well as its

archæology. He will be accompanied by a trained native Indian surveyor, selected for him by Colonel Holdich, of the Indian Survey. It is also hoped that a zoological and a botanical collector will be attached to the expedition, so that the results are likely to be very complete. As on previous expeditions Mrs. Bent will accompany her husband, and among other things will attend to the photography.

Mr. Littledale's Journey in Central Asia.—This traveller writes from Kurla in Chinese Turkistan, under date May 6th, describing his progress up to that time and his plans for an advance across the little-known region which lay before him in the direction of China. He had secured the services of a Ladakhi, who had been with Lord Dunmore, and who spoke Turki, Tibetan, and Hindustani, besides having a man who spoke Chinese and Turki, so that language difficulties had been well overcome. A good supply of transport animals had been collected, and an early start was to be made southward for the Altyn Tagh near Lob Nor, which range Mr. Littledale proposed to cross if possible, and follow its southern side towards Lan-chau-fu. Scarcity of water was the chief trouble to be feared, and failing guides for the Altyn Tagh, he would be compelled to keep to the north of the range, cross the Richtu Mountains (Nan Shan), and follow the Buhain-gol to Koko Nor. Much help had been received from M. Petrovski, Russian Consul at Kashgar, and the Chinese authorities had so far shown themselves exceedingly civil. Mrs. Littledale again accompanies her husband, as on his former journey to the Pamirs.

An Ascent of Ararat.—Mr. H. F. B. Lynch has telegraphed to the Secretary of the Society that he has succeeded in ascending to the summit of Ararat. He and his party (his cousin, Captain Lynch, and the Swiss guide Taugwalder) are travelling in Armenia. The telegram is sent from Erivan, and states that on September 18th they encamped under the summit at the snow-line, and ascended on the 19th, reaching the summit after seven and a half hours' climb. Some successful mountain photographs were taken.

Chitral.—The following extract from a letter of Captain Younghusband, now in charge of the Political Mission in Chitral, where he has been for six months, gives an authentic picture of the last country which has been brought within the limits of the *Pax Britannica*. "It is a delightful country to be stationed in if it were only not so much cut off from civilisation. The people are a hardy, cheery lot of mountaineers who delight in polo, sport, and shows of any kind. The climate is delightful, and the mountains, though not wooded like those of Kashmir, have patches of forest on many of their slopes, and the villages in the valley bottoms are crowded with fruit trees. Chitral has many good points, and it is pleasant to have an opportunity of living in so interesting a country."

Recent Exploration in Tibet.—Mr. E. Delmar Morgan read a paper on this subject at the Nottingham Meeting of the British Association. The author said that while the general features of Tibet have been known from very early times, it has been reserved for recent explorers to acquaint us more closely with the leading characteristics of this marvellous region. Especially is this the case with the northern and central parts of the country, left blank on our maps. The list of these explorations begins with the Brothers Schlagintweit and continues to Captain Bower and Mr. Rockhill's recent journeys. Their discoveries have opened out new fields of research in hitherto inaccessible parts. They have ascertained the continuity of the Kuen Luen system through 26° of longitude, and made known the direction and structure of its principal chains. They have shown the lacustrine character of the central plateaus, and traced almost to their sources some of the

mightiest rivers of Asia. They have thrown light on the climatic conditions of these lofty deserts, and seen an extraordinary abundance of animal life on them. Their researches have proved the existence in former times of a line of flourishing oases along the northern foot of the Kuen Luen, by which the Chinese silk trade passed in the Middle Ages, and have brought to light the rich gold-fields of Northern Tibet. The leading features of this *terra incognita* are well described in Captain Bower's diary, and the whole subject of Tibetan exploration has been treated in the most thorough and admirable manner by M. Dutreuil de Rhins in his *Asie Centrale* and Dr. Wegener.

Formosa.—Mr. Arthur Grant Duff, in a private letter describes a recent visit he paid to Formosa. Sailing from Chefoo, which he describes as the great seaside resort of Northern China, he landed at Kelung, the beautiful port of the north-east of Formosa. The richness of the vegetation to the water's edge is remarkable, the hills from a distance having the appearance of being covered with gigantic moss. He was much impressed by the beauty and fertility of the island, and the wild grandeur of the mountain districts. Formosa is one of the few Chinese provinces with a railway. This line runs from Kelung to a point about 20 miles beyond Tai-pei, and it is proposed to extend it to Tai-nan, about 200 miles to the south. The capital consists of three towns close together—Tai-pei, the official residence, Twatulia, where the Europeans live, and Banka. Mr. Grant Duff also visited Tao-tzu-zuan, the railway to which runs through a fine plain bounded by imposing ranges of hills.

Types of Vegetation in Sakhalin.—M. A. Krasnov, Professor of Geography at the University of Kharkov, last year made a journey in Eastern Asia to study the distribution of plants and other questions connected with the evolution of floras. Some of the results, especially for the island of Sakhalin, appear in the *Annales de Géographie* for July last. Owing to the cold currents to which the island is exposed, its climate is such as usually belongs to much higher latitudes; its flora resembles that of Spitzbergen, and the conditions of plant life must resemble those which prevailed in the glacial epoch in Europe. The most remarkable fact is the existence side by side of distinct types of vegetation, due to variations, not of climate, but of soil and relief. This should be a warning against hasty conclusions as to the succession in past time of distinct types of vegetation in Europe, it being possible that they also existed side by side. The principal types in Sakhalin are:—(1) On the mountain summits, a Polar flora (*Empetrum*, etc.). (2) On the slopes down to sea-level, the *Taiga* or forest of conifers (*Abies* and *Picea*), with birch, maple, and mountain ash, presenting an appearance very like that of European pine-forests. (3) On the level and swampy lands a forest of larch, associated with *sphagnum* and other peat-bog plants. Owing to accumulation of snow the trees often die, and their trunks are found buried in the bogs. The supervening type of vegetation is (4) that of the Siberian Tundras. (5) On the river banks in the plains occur deciduous forests with Manchurian species of *Juglans*, *Quercus*, *Ulmus*, etc. In the south, these alternate with prairies of tall grass of quite a tropical aspect. Of the inhabitants, the nomadic Tunguses people the Tundra, the Orochones hunt in the *Taiga*; on the coasts live the Ainu fishermen, while the Russian exiles reap precarious crops of cereals during their forced sojourn in this inhospitable country. M. Krasnov also visited Kyushu and Java, in the latter of which islands the similarity of the flora on the tops of the volcanoes with that of the Polar swamps, suggested problems as to the evolution of the Polar forms from tropical prototypes.

Trade of Jidda and Hodeida.—From a recently-issued "Report on the Trade of Jeddah" (Foreign Office, 1893, Annual Series, No. 1264) it appears that the mother-of-pearl industry, which at one time was of considerable importance, has of late years very much decreased. The best mother-of-pearl shells in the Red Sea are found farther south, so Massawa being the nearest and most convenient market for them, very little is now produced on the Arabian side of the Red Sea. The export trade is therefore very limited, being confined to mother-of-pearl, gum, skins and hides, and a few minor articles, of which henna is the principal. The imports to Jidda from British India include rice, cotton, and silk goods, cereals, sugar, coffee and tea. Hodeida at present is the most flourishing seaport town in Yemen. Since the fall of Mocha it has acquired most of the coffee trade of that place. It is a large, fortified town, with a population of fifty thousand, situated in lat. $14^{\circ} 49' N.$, long. $42^{\circ} 51' E.$ The principal articles of import are grain, viz., all kinds of cereals, and rice, chiefly from India, and some from Europe; cotton manufactured goods and petroleum from America; sugar and paper from France; and hardware, timber and paper from Austria. As regards exports, cotton and indigo, which grow in the country, are used for the manufacture of a kind of cloth for export to other parts of Arabia. Pearls, senna and myrrh mostly go to India; rock-salt in large quantities is shipped from Salif to India.

Exploration in the Mustagh Mountains—Erratum.—In Mr. Conway's paper in the October number, p. 292, 14 lines from the top of the page, read "7" instead of "5" miles an hour. In the discussion, p. 301, lines 13 and 16 from the bottom, in some copies of the *Journal*, *Kanchanjunga* is given in mistake for *Kishanganga*.

AFRICA.

Dr. Gregory's Expedition to Mount Kenia.—Dr. J. W. Gregory of the Natural History Museum, returned a few days ago from his expedition to Mount Kenia and the neighbouring region. It will be remembered that Dr. Gregory accompanied Lieutenant C. W. Villiers' expedition, which left England for the Jub River in October last year. By the departure of Lieutenant Villiers to join Sir Gerald Portal, the expedition was broken up. Dr. Gregory, however, determined not to return without doing some good work. He therefore, as he stated in the letter published in last month's *Journal*, went to Mombasa, and with forty men proceeded to Mount Kenia. This mountain he ascended to a height of at least 17,000 feet, and found it almost completely glaciated from that height to the summit (about 20,000 feet). Dr. Gregory is a geologist, and the observations which he has been able to make will be found of great scientific importance. He has made large collections not only in geology, but in zoology and botany. He also examined the country around Mount Kenia, and it is expected will be able to throw much new light on the hydrography and the geography generally of this interesting region. Dr. Gregory will probably give an account of his expedition at one of the Society's meetings in January.

Sierra Leone.—The Colonial Report (Miscellaneous No. 3, 1893) on Sierra Leone contains the Reports of Mr. Scott Elliot on the botany and of Miss C. A. Raisin on the geology of the district from specimens collected by the Anglo-French Boundary Commission. The country is everywhere underlain by a gneissose rock, which crops out on the sea-coast, on the tops of the higher plateaux, and forms the broad watershed which separates the Skarcies, Rokelle and Niger drainage areas. This rock, however, is not much seen on the surface of the lower districts, where

the country is covered with reddish laterite. In the north-west corner of the British sphere of influence at Wallia and Baiabaia there is a well marked dolerite flow, in the neighbourhood of which there are some hard slates or argillites. A detailed report of about one hundred specimens of rock is given in an appendix by Miss Raisin. The soil of Sierra Leone belongs to one or other of three classes—that of the hills and high plateaux formed by the disintegration of gneiss or granite; the red laterite which covers all the lower hills down to sea-level; and the alluvium formed mostly by mangroves on the coast and by rivers inland. The whole of the country from Mabile to Rokon, and round from Digipali to Kishom, was once a wide arm of the sea. This has been turned into a rich, vegetable alluvial mud, perhaps better suited for rice-growing than any other soil in existence, by the gradual advance of the mangroves seawards. There are wide alluvial valleys about Musaia and Falaba, at Farana, and on the Upper Skarcies there must be some 500 square miles of alluvium. The greater portion of the country consists of low, rolling hills, once covered by virgin forests. These have been cut down by natives for cassava clearings, and abandoned after four years' cultivation. These abandoned clearings now form a thick impenetrable bush. In the north-west there are plateaux, about 3600 feet in height, and here cattle seem to find better grazings than in any other part of the country. The Skarcies River is a broad stream navigable up to Kambila, whence, up to Konlia, rapids and rocks make it impassable. If good canoes existed on the upper tributaries to take down the produce from the Tamisso country it would greatly cheapen the cost of carriage. The Rokelle is navigable for a considerable distance inland. The climate (excluding the mangrove districts) is not worse than that of India; but it appears improbable that European settlers can ever colonise the country without great loss of life. There are two main highways into the interior. The first is from Port Lokko through Bentembu, Kahreni—whence the road is extremely bad—and Kabusa to Falaba. The other road passes from Port Lokko diagonally to the Talla country and the junction of the Kora and Skarcies Rivers. The best route would probably be up the Rokelle, whence a road could be made to Koronko, which would avoid the difficult country above Kahreni. In the northern parts of the country the population has been almost destroyed by constant fighting, and most of the young men take to slave-trading. Mr. Elliot appends a list of varieties of timber, and a report of the different botanical articles of export. Coffee is indigenous, and is being grown with success. The kola nut grows everywhere, and its good qualities are rapidly acquiring a wide reputation. Pepper, vanilla, ginger, and many other spices, would repay cultivation. The oil palm is one of the most important economic plants, but ground-nuts and sesame are also largely produced. There are several valuable native fibre-plants, and many gum and dye-producing trees.

Italian Exploration in the Somali and Galla Countries.—The activity of Italian explorers in these countries continues unabated. In a recent number of *Petermanns Mittheilungen* (1893, No. 8) there are some details respecting recent expeditions. The most important is that of Captain Bottego, who, starting from Berbera in September 1892 accompanied by Captain Grixoni, and taking the route followed by James, Robecchi and others to the Upper Webi Shebeli, continued his journey till he struck the course of the Gaunale-Diggo (Lesser Gannale or Ganana). This stream, having been followed for twenty-eight days towards its source, proved to be a northern tributary of the Jub, the main stream, or Greater Gannale, flowing a ten days' march further south. This was also reached, after which the explorers separated, Grixoni making his way direct to Bardera and the coast, while Bottego purposed continuing his route westwards to define the relations

of the Upper Jub with Lake Rudolf and Kaffa, hoping afterwards to follow the river to its mouth. Grixoni, on his way to Bardera, first traversed an uninhabited and waterless tract for seven days, then followed a tributary of the Jub on the right bank for eight days more, after which he struck across to an important centre of Somali population, called Luk, or Logh. He thus effected a crossing of the Eastern Horn of Africa further west than Robecchi. Another expedition is that of Prince E. Ruspoli, who reached the Upper Jub by a route a little to the south of Bottego's.

AMERICA.

Climatology of the Cotton-Plant.—Dr. P. H. Mell contributes a report (*Bulletin* No. 8) on the climatology of the cotton-plant to the U.S. Weather Bureau. He deals with the three chief varieties, the *Gossypium bahama*, native to Egypt, the *Gossypium barbadense* from Persia, and the *Gossypium herbaceum*, a name applied to all cotton grown in the interior of the cotton belt. At the opening of the American civil war in 1861, the cotton region included South Carolina, Georgia, and Florida, Alabama, Mississippi, Louisiana, part of Tennessee, Arkansas and Texas, between the Gulf of Mexico and 34° N. lat. Up to 1860, this belt was gradually extending east, west, and north. On the east it reached the coast of North Carolina, on the west as far as the Rio del Norte in Texas. The counties around Memphis were the most productive. A line running a little north of the 36th parallel marked the northern limit of the cotton belt, which was bounded on the south by the 29th parallel. But owing to increased demands after the war, attempts were made to force the cultivation of cotton to the north of this limit. All such attempts to extend the cotton-growing area much beyond Tennessee have failed, and at present the limits remain nearly what they were in 1860. The regions of high percentage are confined mostly to the central parts of Mississippi, Alabama and Georgia, where the area under cotton averages above 65 acres per square mile. Regions of maximum growth of cotton form two belts, one lying along the Mississippi within the alluvial region, while the other lies in the black prairie district stretching from north-eastern Mississippi south-eastward through the centre of Alabama. In Tennessee it is to be noticed that the counties which produce most cotton are the most southerly ones, and the production decreases almost uniformly towards the north. This is specially so in West Tennessee, and in explanation it is to be noted that the isotherms for spring and autumn extend north-west through the state parallel with a line running through Chattanooga and Trenton. The cretaceous formations, as in the "Black Belt" of Alabama, have been found most adapted to the growth of the cotton-plant. Dr. Mell proceeds to contrast the climate of the southern States with that of other cotton-growing countries, the West Indies, India, Mexico, Australia, Brazil, the Argentine and Egypt, and concludes that only in the southern States are found such uniform distribution of rain, and such gradual changes of temperature as are essential to the perfect growth of cotton. In the cotton belt the mean temperature of the three summer months is remarkably uniform; in June, the mean ranged between 81° and 76°, in July between 83° and 78°·5, and in August, between 81°·5 and 78°·5. The mean daily maxima and minima are never great extremes. During the twelve years under discussion, the mean maximum varied only 4° in June, 4° in July, and 3° in August. The mean minimum for June varied only 3°·5, for July 3°, and for August 3°. During the winter months the variation was much greater. An attempt has been made to secure data for a comparison of the soil temperatures in different districts of the cotton belt, but as yet observations have only been made at Auburn and Uniontown, and that only during a period of two months.

POLAR REGIONS.

Arctic Exploring Expeditions.—News comes through Mr. F. G. Jackson, who is travelling in the Yalmal Peninsula, from Yugor Straits dated August 30th, that Dr. Nansen had finally left the Straits only ten days previously. Further intelligence states that the new Russian vessels from Dumbarten proceeded into the Kara Sea by way of Yugor Straits, and arrived at Golchikha (probably Golchinsky) on September 3rd, discharging cargoes of rails. Captain Wiggins, in charge of another vessel with railway material for the trans-Siberian railway, has also made a successful voyage to the Yenisei. The *Fram* has in all likelihood passed the Yenisei, if she has not reached the Olenek, where Dr. Nansen expected to be by this time. Lieut. Peary's Greenland expedition reached Bowdoin Bay, 78° 35' N. on August 3rd. They left St. Johns on July 4th. Heavy weather lost them some mules and their most valued dog. After calling at Hopedale, Holsteinborg was reached on July 26th, two days later Godhavn, and Upernavik and Tasaisak soon after. Verhoef, the ill-fated geologist of the first expedition, must, they finally concluded, have perished in the attempt to cross the glacier now bearing his name. The *Falcon* weighed anchor on August 20th on her return. Walruses were killed for their eighty-nine dogs; and eider ducks and reindeer secured. The house was built, and Astrup commenced taking provisions and gear up on to the inland ice. Lieut. Peary and a party are hunting reindeer, and expect to secure seventy or more; while Astrup with two men and fifty dogs are conveying provisions to certain depôts, possibly sledging half way to Independence Bay. All is well and their hopes sanguine. An American steam whaler, the *Newport*, which wintered at Herschel Island just west of the Mackenzie River, is reported, in that longitude, to have reached 84° N.; but confirmation is necessary, and the ship's log and instruments must be examined before the statement is received with confidence. If the position is verified, the *Newport* succeeded in reaching 50 miles farther north than any previous explorers have attained, so far as authentic information goes.

Mr. Jackson's Expedition to the Yalmal Peninsula.—A letter has recently been received from Mr. Frederick G. Jackson, dated August 28th, and written at the entrance to the Yugor Straits, in which he mentions that he is proceeding to the Yalmal Peninsula by land from Khabarova. As he is alone, he is taking two or three Samoyedes to help with his sledges. Whether he will be able, after all, to include the southern island of Novaya Zemlya in his journey this winter will depend upon the success which attends his exploration of Yalmal; but as he hopes to return to England in the early spring, it is more than doubtful. From some remarks in his letter it would seem that the ice is not so favourable in the Kara Sea as had been expected, but of the conditions eastwards news may be received later on from Nansen. Mr. Jackson has four sledges with him—two of Norwegian make (10 feet 6 inches by 18 inches, and 9 feet 6 inches by 18 inches; weight equal to 17 pounds); one of English make (9 feet by 22 inches; weight equal to 24 pounds); and a Canadian toboggan, shod with steel. He is using both Canadian snow-shoes and *ski*. He will eventually sledge back to Archangel, and hopes to be there by the end of February. We may anticipate some interesting records of temperature as well as some new information about the Samoyedes.

Lieutenant Garde's Greenland Expedition.—Last summer another expedition was at work on the inland ice and the coast of Greenland, despatched by the Commission for the Guidance of the Geological and Geographical Researches in

Greenland of Copenhagen. It was conducted by the Danish lieutenant, Th. V. Garde, who was one of the members of the celebrated Eskimo boat expedition along the east coast in 1883-85 under Lieutenant Hahn. Lieutenant Garde was accompanied by Lieutenant Count Carl Moltke and Herr Johan Petersen, of the Royal Greenland Trading Society. The expedition left Copenhagen in April in the steam trader the *Hvidbjørn*, and arrived at Frederikshaab in May, whence it proceeded to Julianehaab, in order to make a geographical survey of the coast. Writing from a small trading station, Kagsimuit, on July 1st in lat. $60^{\circ} 47' N.$ and long. $48^{\circ} 10' W.$, Lieutenant Garde states that he had with his companions just returned from a trip on the inland ice, which had lasted from June 16th to the 28th, having covered in all some 250 miles (English), and reached halfway inland in the latitude of Frederikshaab. The party started from Sermitsialik Glacier, falling into the sea in lat. $60^{\circ} N.$ and long. $47^{\circ} N.$ They marched first for about 100 miles in a direction north-east by $\frac{1}{4}$ east, then 10 miles east, where the ridge of the country was attained in an altitude of about 7000 feet. Thence they tramped to the south-east towards a "Nunatak," or mountain peak in the ice, a little more than 7000 feet in height, situated to the north of Julianehaab, and called Aputajuitsok. Hence the party marched back along the Ikersuak Fjord on its northern shores to their starting-point. The party only walked at night when the snow was hard with the frost, as the sun made it soft, nearly the entire journey being performed on foot in boots, snowshoes being only used occasionally. Provisions, etc., were carried on two sledges. Close to the seashore the ice was difficult to traverse owing to fissures; but all went well. Further, Garde reports that during the boat journey southwards from Frederikshaab they sailed *outside* Nunarsuit, in spite of some ice. The latter is an island of considerable size in lat. $60\frac{1}{2}^{\circ} N.$, and long. $48^{\circ} W.$ No former expedition has sailed outside this island on account of the heavy drift-ice there, and it has not been previously surveyed geographically. There was, however, much heavy ice in this locality at the time, but the weather was fine. The expedition was to return by the last vessel from Greenland this autumn, when it is expected that this exploration of the inland ice will throw some fresh light on this interesting subject.

Dr. Drygalski's Greenland Expedition.—Owing to an unusually mild season, the expedition sent by the Berlin Geographical Society, under Dr. Drygalski, which wintered on the Karajak Fiord, was able to make good progress with scientific observations, by means of short excursions, including one to the great Jakobshavn glacier, which has changed considerably since Steenstrup's visit.

The Currents of the Arctic Seas.—In the *Kölnische Zeitung*, with reference to Dr. Nansen's Polar expedition, Dr. Köppen, editor of the well-known *Annalen der Hydrographie*, advances a proposal for the study of the Arctic currents by throwing into the sea or placing on ice-floes objects which on their re-discovery would indicate their drift, particularly where the direction is towards the Pole, *i.e.*, between Novaya Zemlya and Bering Strait. If, remarks Dr. Köppen, certain articles of the *Jeannette* expedition drifted on floes right away from the New Siberian Islands to the south of Greenland, other objects should also find their way thither, *i.e.*, getting into the East Greenland current and come ashore at Cape Farewell or in Massachusetts, or at all events fall into human hands somehow. As is well known Nansen's expedition is based on the theory of such a current. Dr. Köppen advocates for his scheme either the use of the strong glass bottles invented by the Prince of Monaco, and employed by him in the Atlantic Ocean, enclosing slips of paper, and encased in copper with a layer of tar between, or simply pieces of hard wood, bearing

inscriptions in metal studs. He particularly recommends his scheme to the attention of the American whalers which every year hunt in the regions north of Bering Strait.

Norwegian Antarctic Whaling Expedition.—The Norwegians continue to prosecute the Antarctic whale or seal-fishery. The steam-whaler *Antarctic* (formerly *Cap Nor*) sailed from Tönsberg for the Antarctic in the middle of September, and passed Dover on the 27th. She is barque-rigged, carries royals, and to ensure greater speed has an unusual spread of canvas. The vessel is 226 tons register, and carries eight whale-boats, and, like Svend Föyn's other ships, is painted green with a yellow stripe. She is altogether a good model and a swift sailer, drawing on her departure 17 feet (Norwegian). She was sent out by Commander Svend Föyn, and is in charge of Mr. H. J. Bull, her sailing-master being Captain Leonard Christensen; the crew numbers twenty-six all told, and the craft is considered the best equipped whaler that ever left Norway. There will not be time to call at Sydney, as was originally intended, but the ship will steer for the Crozet Islands, and thence, should she reach there about the beginning of January, will proceed south by Kerguelen to the ice, and passing Sabrina and Adelie Land, a search will be made for open water between 75° S. and 78° S. in Ross's position near South Victoria Land, with the hope of finding good whaling grounds. Should circumstances compel the *Antarctic* to call at Sydney, the expedition will search for whales about Macquarie, Emerald, Campbell, and Auckland Isles during the winter, and penetrate further south the next summer. Considerable interest is attached to this expedition, since regions will be traversed which have only been visited by Ross. Although there is no special scientific staff on board, meteorological and other observations will be made, Mr. Bull having received instructions from the Norwegian Meteorological Institute and Christiania University.

OBITUARY.

Admiral Jansen.—By the death of Rear-Admiral Marin H. Jansen, of the Royal Netherlands Navy, the Society has lost one of the most active and accomplished of its honorary corresponding members, and one who took a sympathetic and zealous interest in our welfare. Born at Antwerp on September 10th, 1817, he was bent on becoming a sailor from his earliest years. When the Belgian rebellion broke out, being only twelve years of age, nothing could restrain his youthful ardour. He found his way to one of the forts held for the Dutch by the Duke of Saxe Weimar, and thence on board the corvette *Proserpine* in the Scheldt, commanded by his uncle Captain Van Maren. The patriotic little lad remained on board until November 1831, taking part in the conquest of the left bank of the Scheldt from Fort Marie westward.

Jansen's parents removed to Delft in Holland, and the young volunteer was sent to the Naval Institute. After four years he was appointed midshipman of the first-class, on board the frigate *Bellona*, cruising in the North Sea; and in 1836 he sailed for the Netherlands Indies, where he was placed under the orders of Captain Koopman at Soerabaja.

In 1837 he entered the marine surveying service, being appointed to the schooner *Crocodile*, and for three years he was occupied in surveying the Riouw Archipelago in the Straits of Sunda. He returned to Holland in 1841, on board the frigate *Muas*, commanded by his uncle Captain Van Maren, and soon afterwards was entrusted

with the command of a gun-boat in the Scheldt. But he was not long in Europe, for in October 1842 he was again sent out to the East Indies on board the frigate *Palembang*. By that time he had established a position for himself as an able surveyor. He was entrusted with the survey of the navigable water of the Wester, near Soerabaia, and afterwards became a member of the commission for improving the navigation. In 1844 Jansen mapped the east coast of Bintong, and in July 1845 he fixed his head-quarters at Padang, thence correcting the survey of the Sumatra coast.

Jansen was recalled to Batavia for more active service in 1847, and was promoted for the extraordinary rapidity with which he helped to organise an expedition to Bali. For his admirable surveying service he was created a Chevalier of the Order of the Golden Lion, and received a gold watch and chain from the merchants of Java. Returning to Holland in shattered health, he was soon afterwards associated with Captain Bruining in a commission for the defence of the southern frontier, and this led to an appointment in the Colonial Office at the Hague, in 1849. At this time Jansen published two naval pamphlets, and various useful measures connected with the colonies were due to his initiative. In April 1851 he resumed active service in the navy, as a lieutenant on board the frigate *Prins van Oranje*, under the command of Captain Bijl De Vroe. Jansen served in this vessel in the Mediterranean, West Indies, and on the coast of Central America. He also visited Washington at a time when Maury was at the height of his fame, forming a life-long friendship with the illustrious American hydrographer.

In June 1852 Jansen was once more in Holland, actively engaged on geographical and other work, always with a view to furthering the interests of his country. He brought the model of a clipper from New York, after which the *Kosmopoleit*, owned by the brothers Blussé, and other vessels, were built. In 1853 he was the representative for the Netherlands at the Congress held at Brussels for establishing an international system of observations, and in the following year he was appointed naval assistant to Buys Ballot, in the meteorological observatory at Utrecht.

In 1855 Maury had published the first edition of his fascinating book, 'The Physical Geography of the Sea'; and in the same year Jansen brought out a Dutch translation with valuable appendices on land and sea breezes in the tropics, and on ozone, which Maury wisely incorporated in subsequent editions, at the same time offering a well-deserved tribute of appreciative praise to his accomplished coadjutor. "Jansen," he wrote, "has helped me to enrich my work with his fine thoughts. The reader will, I am sure, feel as I do, deeply indebted to him for so much instructive matter set forth in his very delightful and pleasant manner. Among those whose debtor I am, stands first and foremost the clear head and warm heart of this Dutch officer, whom I am proud to call my friend. He is an ornament to his profession, and a more accomplished officer it has never been my good fortune to meet in any service. Jansen has served many years in the East Indies. He observed minutely and well. He has enriched my humble contributions to the 'Physical Geography of the Sea' from the store-house of his knowledge, set off and presented in many fine pictures. He has added chapters on land and sea breezes, on the changing of the monsoons, on the south-east trades of the South Atlantic, and on winds and currents generally."

Towards the end of 1855 Jansen was sent to England to sail in the trial trip of the *Royal Charter* to Australia. He went from Melbourne, Torres Strait, to Batavia, returning to Europe in 1857. After a short service in the Dutch Ministry of Marine, he received command of the steamer *Djambi* to form part of the Dutch squadron in the West Indies from 1861 to 1862. After this tropical service Jansen visited England, France, and Germany to make himself acquainted with the latest

phases in naval construction and ornament, and in 1864 he published an important work entitled 'The Latest Discoveries in Maritime Affairs.' In the following year he was appointed Commodore of the last Dutch sailing squadron; and soon afterwards was entrusted with the responsible duty of superintending the building of the iron-clad *Prins Hendrik* by Messrs Laird at Birkenhead.

In 1867 Captain Jansen took command of the *Prins Hendrik*, and went on an experimental cruise in the North Sea and English Channel, trying her qualities in all weathers. He put her out of commission at Nieuwediep in 1868, and retired from active service after a distinguished naval career of thirty-five years. On this occasion he was decorated with the Commandery of the Oaken Crown.

Commodore Jansen had become an Honorary Corresponding Member of our Society in 1865, and always took a deep interest in our proceedings and in our welfare. We have never had a correspondent who was so ready and anxious to assist us by every means in his power. When the question of an Arctic expedition was under discussion, Jansen gave up much time to an examination of the Dutch Archives, with a view to a study of the ice in the Spitzbergen Seas, as reported by the Dutch whalers during the last three centuries. The results of these investigations were embodied in a most valuable and original paper which was published in our *Proceedings* (Old Series, IX., p. 163). Jansen also examined the archives at Middelburg, assisted by Professor Veth, for information respecting discoveries in Tibet, and collected all that is known of the remarkable journey of Samuel Van de Putte from India, through Lhasa, to China. In 1869 Jansen published an important pamphlet, which excited much attention at the time, entitled 'A Bridge over the Ocean,' advocating the establishment of lines of large steamers to America. In 1873 he was appointed to represent the Netherlands at Constantinople, in the commission for establishing uniformity in ship measurements, when he received from the Sultan the Order of the Osmaniè. In the following year Jansen was appointed to the honourable and dignified post of a Councillor of State, which he continued to fill until his death. He also attained the rank of Rear-Admiral.

Jansen was the chief promoter of a revival of Arctic exploration in Holland, being ably, and, indeed, enthusiastically, seconded by his young friend, Lieutenant Koolmans Beynen. The veteran sailor always felt the warmest sympathy for the aspirations of his youthful brother officers; and his encouragement of the patriotic ardour of young Beynen led to the formation of an Arctic Committee at the Hague, and to an appeal to the public for funds. On April 6th, 1878, the schooner *Willem Barents* was launched, and sailed for the Arctic Seas, under the command of Lieutenant A. de Bruyne, with Beynen as his second. Admiral Jansen drew up the instructions. He considered that the Barents Sea, between Spitzbergen and Novaya Zemlya, would make an excellent training-ground for Dutch seamen, but that the first voyage should be confined within the limits of what is easily attainable. He thought that, by yearly increasing knowledge and experience, his countrymen might in time be in a position to undertake more hazardous and difficult voyages. The *Willem Barents* went direct to Amsterdam Island, near the north-west point of Spitzbergen, and then dredged and took deep-sea soundings in the Barents Sea. The first voyage was, in Beynen's words, "a scientific examination of the sea that bears the name of the greatest of our mariners."

On the little schooner's return, the young officer who had been the mainstay of the expedition was ordered to the East Indies. Beynen died of fever at Macassar, and his loss was deeply felt, not only in Holland, but also by many warm friends in our Society; but none mourned for this brave young fellow more deeply than Admiral Jansen, who looked upon him almost as a son. He loved the young Lieutenant for his ardent patriotism, for his Arctic enthusiasm, and for his devotion

to duty. The aspirations of his own youth seemed to be revived in the career of Beynen. His grief for Beynen's untimely death was deep and abiding.

Jansen continued to send out the *Willem Barents* on those summer cruises which have proved so valuable to science. In her second voyage Franz Josef Land was sighted, and a large natural history collection was brought home. In 1880, on her third voyage, the little schooner got on shore on the coast of Novaya Zemlya and was nearly lost, so that little was done; but in 1881, with Captain Broekhuysen in command, much valuable work was achieved. During her fifth voyage, in 1882, the *Willem Barents* was the first vessel to find and welcome Mr. Leigh Smith's boats retreating from Franz Josef Land. The sixth and seventh voyages, under Lieutenant Dalen, also brought back valuable collections and hydrographic information; and thus the useful and patriotic enterprise initiated by Jansen, and his young friend Beynen, was steadily persevered in during a course of years.

In his declining days Jansen suffered from rheumatism and defect of vision, but he was surrounded by numerous devoted friends of a younger generation. He was a tall man with very erect carriage, a high intellectual forehead, and a very benevolent expression of countenance, full of sympathy for the interests and anxieties of his friends, and a most delightful companion. He was an admirable *raconteur*, though always more ready to show interest in what occupied the minds of his companions, than to talk of his own experiences. The events of his long and most useful life sufficiently set forth his higher qualities. The great mass of information on many subjects with which his mind was stored, was lightened by the play of a bright and vivid imagination. A most able and accomplished seaman and a sound geographer, he was also a wise and prudent statesman.

During the last year Jansen was seldom able to go out. He passed most of his time in his chair, writing and reading. During last September his strength declined rapidly, and he died at the Hague on the 9th. On the next day he would have completed his 77th year. His mind was clear to the last, and he suffered without a murmur, or a word of complaint. He was always cheerful, when friends came to see him, and took the deepest interest in their welfare to the very last.

In Admiral Jansen our Society has lost one of the truest and most active of our foreign friends, and the sorrow for his death will not be confined to his own country. Among many others, the present writer deeply feels the severance of a warm friendship extending over more than a quarter of a century. C. R. M.

Emin Pasha (Dr. E. Schnitzer).—Of Emin Pasha's fate there can now be no further doubt.

Edward Schnitzer was born on March 28th, 1840, at Neisse, the son of a merchant. He studied medicine at the universities of Breslau, Berlin and Königsberg, and having graduated in 1864, his strong desire to travel and love of natural history led him to the East. Ismail Hakki Pasha, at that time Governor of Scutari, appointed him harbour-surgeon at Antivari, and subsequently he accompanied his patron on various official journeys and military expeditions, which made him acquainted with Armenia, Syria and Arabia. Ismail died in 1873. Early in his Oriental career, Dr. Schnitzer assumed the name of Emin, "the faithful one," because he believed that this would enable him to obtain a better insight into the Islam world, than would have been possible to a Frank. But he wrote to his sister in 1871, "I have only adopted the *name*, I have not become a Turk."

After a short visit to his native town in 1875, Dr. Schnitzer sought service in Egypt, and was appointed chief medical officer in the Equatorial Province, of which Gordon Pasha was then Governor. Gordon fully appreciated the great gifts of his

medical officer, and intrusted him with various diplomatic missions. It was thus he visited Uganda, twice, in 1876 and again in 1878, and King Kabrega of Unyoro in 1877. In 1878 Gordon Pasha, who had assumed the reins as Governor-General of the Egyptian Sudan, appointed his former medical officer Governor of the Equatorial Province. This is not the place to speak of Emin's achievements in that capacity, achievements all the more deserving of recognition, as they were attained in the face of considerable difficulties. Of the value of his geographical and scientific work there can be no doubt. Every portion of the wide region entrusted to his care became known to him by personal observation, and his descriptions of the countries through which he passed and the care with which he mapped his routes may serve as patterns to all engaged in the exploration of Equatorial Africa. His collections, too, have enriched the museums of England and of his native country, and the esteem in which Emin is held by naturalists is quite as great as that entertained for him by geographers.

When the Mahdi's rebellion broke out in the Sudan all communications with the Equatorial Province ceased for a time, and schemes for the "relief" of its governor were set on foot. Of the various expeditions fitted out for that purpose only that led by Mr. H. M. Stanley attained its object; but it was with evident reluctance that Emin left behind him a country, which years of arduous labour had endeared to him, and followed his "liberator" to the east coast.

Emin's sensitive nature shrunk from a visit to Europe, and, when he had recovered from a serious accident, he gladly entered the German service, and took the lead of an expedition which was to establish stations on the Victoria Nyanza. He left the coast on April 20th, 1890, occupied Tabora, on the main-road connecting Bagamoyo with Lake Tanganyika, and then founded the station of Bukoba, on the western shore of the Victoria Nyanza. But this accomplished, his old love of travel appears to have revived. Disregarding the somewhat peremptory instructions of his superiors, he crossed over into the British sphere, visited his and Stanley's old camping-ground at Kavalli's,—where his old soldiers, since taken into the service of the British East Africa Company, received him but coldly,—and made an effort to push northward and north-westward in the direction of the Upper Welle, probably intending to make his way through the unexplored Niamniam countries to Lake Chad. An account of this expedition has been rendered by Dr. Stuhlmann,* the companion of Emin, and by Emin himself in delightful letters of travel published in *Westermann's Monatshefte*.

When Dr. Stuhlmann left Undusuma on December 10th, 1891, Emin was ill and nearly blind, and the people around him were dying of small-pox. Conflicting rumours were beginning to circulate with respect to his fate. Lieutenant Langheld, the commandant of the German station of Bukoba, appealed to Captain Lugard to send relief to Emin, who was then believed to be still at Kavalli. Captain Lugard cordially responded to this appeal, but when his messengers reached Kavalli's, they found that Emin had joined some of Kilonga Longa's Manyema, and had started with them on March 12th, 1892, for the west. The rest of Emin's melancholy story has become known to us through Lieutenant Dhanis. The Manyema, who had undertaken to conduct Emin to the Congo, travelled slowly. It was May 29th before they left a camp on the upper Ituri, in long. 29° 50' E. Passing through Indekuru, they reached Ipoto, the headquarters of Kilonga Longa in Stanley's days, on August 1st. Eight days afterwards, on the 9th, Emin had the misfortune to lose the whole of his scientific collections in the Kunde rapids. On the 20th of the month named Emin left the Ituri, and taking a route marked on Mr. Stanley's

* See map and account in *Proceedings, R.G.S.*, 1892, p. 542.

map as being used by "ivory raiders," he reached the country of the Walumbi (Urimbi), where a stock of provisions was laid in to enable him to cross the uninhabited forest which separated him from Kinena's villages near the Congo. On October 12th he reached Muomena, one of these villages, within three days' journey from Kibonge's town on the Congo (0° 52' S., 25° 50' E.), and there, on the 20th, he was murdered by order of Mwini Mohara, the "brother" and "commander-in-chief" of Tippu Tib. The accomplishment of this evil deed was intrusted to Said ben Abed, but the actual executioner was a Nyambara* named Ismaeli, a man actually in Emin's service. Lieutenant Dhanis has succeeded in recovering a box containing Emin's journals, and these have been forwarded to Europe.

Thus perished miserably, in the wilds of Africa, a man who had devoted many years of his life to the cause of African civilisation, whose scientific work had secured him a foremost place in the devoted band to whose labours we are indebted for our knowledge of the Dark Continent, and whose unselfishness, amiability, and strong sense of duty are extolled by all who came into contact with him. Emin has left behind him an only child, the daughter of an Abyssinian wife, to whom he was devotedly attached, and who is now with her aunt at Neisse.

Dr.† Schnitzer never published a book of travel, but numerous papers from his pen have appeared in *Petermanns Mittheilungen*, the publications of the geographical societies of Leipzig and Vienna, the *Zeitschrift* of the Berlin Anthropological Society, the *Ausland*, and *Westermann's Monatshefte*. A collection of the more interesting of these papers, edited and annotated by Prof. G. Schweinfurth, Prof. Ratzel, Dr. Felkin, and Dr. Hartlaub, was published at Leipzig in 1888, and in an enlarged English version in the same year.†

In 1890 Emin was awarded the Patron's Medal of the Royal Geographical Society.
E. G. R.

Surgeon-Major T. H. Parke.—One more of the band of men who accompanied Mr. Stanley in his memorable expedition for the relief of Emin Pasha has passed away. Surgeon-Major Parke died suddenly at Alt-na-craig, Ardrishaig, on September 10th whilst on a visit to the Duke of St. Albans.

Thomas Heazle Parke was born on November 27th, 1857, at Drumona. He was educated at Dublin, and joined the Army Medical Staff in 1881. In 1882 he was with the expedition for the relief of Gordon, and was present at the actions of Abu Klea, Gubat and Metameh, and was subsequently placed in charge of the Helwan cholera camp. He volunteered to join Mr. Stanley's expedition, and won golden opinions not only from his chief, but from all its members, whether European or native. Mr. Stanley extols him for his "excellence as a physician and his skill as a surgeon;" speaks of his "priceless services," and describes him as a "a combination of sweetness and simplicity." Mr. or rather Dr. Parke (for the university of Durham bestowed upon him the honorary degree of D.C.L.) was the author of several medical papers. He also wrote a book on his 'Experiences in Central Africa' (Sampson Low, 1891), and a 'Guide to Health in Africa' (same publishers, 1893). For the forthcoming new edition of 'Hints to Travellers,' Dr. Parke wrote the Medical Section.

H. M. Becher.—We regret to announce the death of Mr. H. M. Becher, who joined this Society last year. In the early part of September Mr. Becher was employed, on behalf of the Royal Geographical Society, on a Survey Exploration into the Province of Trengganu, Malay Peninsula, the main object of which was to

* The Nyambara are a tribe in Emin's old province.

† 'Emin Pasha in Central Africa' (G. Philip & Son).

explore and locate on the map the mountain called "Gunong Tahan," and it was while engaged upon this work that he met his death by drowning in the River Tahan. In the previous July Mr. Becher had made a coast voyage to the Port of Trengganu, and, having interviewed the Sultan endeavoured, but without success, to obtain his sanction to a general survey of the rivers of this province. Mr. Becher thence returned by sea to Singapore, having succeeded in making a fair flying survey of the coast of Trengganu, which will constitute a valuable addition to the Royal Asiatic Society's Map of the peninsula. Mr. Becher was a mining engineer of eighteen years' standing, and had travelled extensively in the exercise of his profession, having visited various places in the East including Borneo, Siam, China, Japan, Corea and Siberia, and many parts of the Malay Peninsula. He had also visited mining regions in Germany and Spain and in America. Mr. Becher was an A.R.S.M., Associate M.I.C.E., member of the Geological Society, and of the Royal Asiatic Society. He was in his 39th year when he met his death.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. R. = Comptes Rendus.	S. = Society, Société, Selskab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mittheilungen.	Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is $10 \times 6\frac{1}{2}$.

EUROPE.

Austria-Hungary—Dictionary of Places.

Grissinger.

Artaria's Orts-Lexikon der österreichisch-ungarischen Monarchie (incl. Occupationsgebiet, 1885) nach der Zählung von 1890, enthaltend alle Orte mit mehr als 2000 Einwohnern, Kur- und Badeorte, etc., sowie touristisch wichtige Ortschaften mit Angabe der Meereshöhen. Bearbeitet von Dr. K. Grissinger. Vienna, Artaria & Co., 1893: size $6\frac{1}{2} \times 5$, pp. vii. and 79. *Presented by the Publishers.*

A compact and useful index of place-names in the Austro-Hungarian monarchy with statistics of the last census.

Bosnia.

Jahresbericht V. Erdk. Dresden 23 (1893): 124-160.

Schubert

Das heutige Bosnien. Eine militärische Culturarbeit Oesterreich-Ungarns in Krieg und Frieden, von Hauptmann von Schubert.

The paper now published was written in 1890.

Channel Islands. *Tour du Monde* (1893): 161-224. **Boland.**

Les Iles de la Manche (Mœurs et Paysages), par M. Henri Boland.

An illustrated description of Jersey and Guernsey, including a sketch-map showing the distribution of French- and English-speaking people in 1850 and 1893.

Cyprus. **Konstantinidos.**

Topographia tes insou Kuprou pros chresin ton demotikon scholeion upo G. M. Konstantinidou. Ekdosis de-utera. Genomene epi te basei tes teleutaia apographe. Larnaka. Ek tou Tupographeiou e Philokalia, 1893. Size 9 × 6, pp. 22. *Presented by the Author.*

England—Cornwall. **Murray.**

A Handbook for Travellers in Cornwall. Eleventh edition, revised. *With maps.* London, John Murray, 1893: size 7 × 4½, pp. [51] and 181. *Price 6s. Presented by the Publisher.*

The present edition is illustrated with a complete set of new maps on a large scale, and its utility is enhanced by thorough revision.

France—Bramabian. *B.S.G. Paris* 14 (1893): 98-120. **Martel.**

La Rivière souterraine de Bramabian (Gard), par E. A. Martel.

Germany—Pomerania. *Globus* 64 (1893): 237-241. **Deecke.**

Ueber Dünen und Diluvialsande auf den pommerschen Inseln. Von Prof. W. Deecke, Greifswald.

Italy—Rovigo. **Corti.**

Le Provincie D'Italia sotto l'aspetto Geografico e Storico, descritte da Siro Corti. No. 54. Regione Veneta. Provincia di Rovigo. Rome, Paravia e C. 1892. Size 8 × 5, pp. 48. *Map and illustrations. Price 50c.*

Norway—Rainfall.

Nedbør-høiden i Norge, beregnet efter observationer 1867 til 1891 af det meteorologiske institut.

Tables of the rainfall at one hundred stations in Norway, giving the annual and monthly averages, maxima and minima.

ASIA.

Central Asia. *Missions en Chine et au Congo* 1893 *passim.* **Deken.**

Voyage à Travers l'Asie. Par C. de Deken, Miss. Ap.

Account of the journey across Central Asia with Prince Henry of Orleans and M. Bonvalot.

Central Asia—Turkistan. **Ostroumoff.**

A Geography of the Turkistan Country, with a short Account of the Khanates of Bokhara and Khiva, and a Map of the Country. Compiled by N. V. Ostroumoff. Samarkand, 1891. Translated by Staff-Lieutenant E. Peach, I.B. Size 10 × 6½, pp. 74. *Map. From the 'Journal' of the United Service Institution of India, 1893.*

Translation of the official text-book of geography used in the government schools of Russian Turkestan.

India—Benares. *B.A.R. Belgique* 23 (1892): 306-338. **Robie.**

Benarés. Par Jean Robie, Membre de l'Académie Royale de Belgique.

Narrative of a visit to Benares.

India—Gurdáspur.

Gazetteer of the Gurdáspur District, 1891-92. Compiled and published under the authority of the Punjab Government, Lahore, *Civil and Military Gazette Press.* Size 9½ × 6½, pp. vii, 197, and xxxix. *Presented by the Secretary of State for India.*

The Gurdáspur district is the north-easternmost of the six districts of the Lahore division, and lies between north latitude 31° 36' and 32° 30', and east longitude 74° 56' and 75° 45'.

India—Sikkim.**Waddell.**

A List of Sikkim Birds, showing their Geographical Distribution. By L. A. Waddell, F.L.S. [*Proof*]. Size $11\frac{1}{2} \times 9$, pp. 70. *Presented by the Author.*

Japan—Earthquake.**Koto.**

On the Cause of the Great Earthquake in Central Japan, 1891. By B. Koto, PH.D., Professor of Geology, Imperial University. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 295–353. *Plats. Reprinted from the 'Journal' of the College of Science, Imperial University, Japan, vol. v., part iv., 1893. Presented by the Author.*

This interesting monograph will be summarised in the *Journal*.

Japan—Fujiyama. *Deutsche Rundschau G.* **16** (1893): 1–10.**Kreitner.**

Der Fuji yama. Von Gustav v. Kreitner.

Describes, with illustrations, an ascent of Fujiyama on August 28th, 1891, two months before the great earthquake.

Java.*B.S.G. Paris* **14** (1893): 121–148.**Eekhout.**

Ouest de Java. La Race soundanaise; ses rapports avec les Hollandais et le pays qu'elle habite d'après les sources les plus recentes. Par R. A. Eekhout.

Palestine—Jerusalem.**Lees.**

Jerusalem Illustrated. By G. Robinson Lees, F.R.G.S. With a preface by the Right Rev. Bishop Blyth, of Jerusalem, and an Appendix illustrating the models of Herr Baurath von Schickkriter, with descriptive letterpress. Translated by the Rev. J. E. Hanauer. Newcastle-on-Tyne, Mawson, Swan, & Morgan. London, Gay & Bird, 1893: size 9×6 , pp. 163. *Presented by the Publishers.*

Gives a good idea of the present state of Jerusalem and its people, with illustrations of the most prominent objects of interest.

Persia—Bisutun. *Globus* **64** (1893): 169–174, 187–191, 207–212, 228–232.**Albu.**

Ein Besuch in Bizutun (Bisutun) Von Sanitätsrat Dr. J. Albu.

Account of a visit to Bisutun in 1889, with historical references and numerous illustrations of sculptures and objects of archæological interest.

Persia and Kurdistan.*B.S.G. Paris* **14** (1893): 5–28.**Morgan.**

Relation sommaire d'un voyage en Perse et dans le Kurdistan. Par J. de Morgan. Mission du Ministère de l'Instruction Publique (1889–91).

M. and Mme. de Morgan travelled for two years in Persia, entering it from Russian territory, going by Resht as far east as Asterabad, and returning *via* Teheran, travelling through Aserbaijan, Kurdistan, and Luristan to the Persian Gulf.

Russian Central Asia. *Rev. G. (Paris)* **34** (1893): 161–174.**Gault.**

La Vallée du Zérafchane. Par P. Gault.

Account of the valley of the Zarafshan, with a map.

Siberian Railway.*Rev. Française* **18** (1893): 241–258.

Le Chemin de fer transsibérien. *With sketch-map.*

AFRICA.**Abyssinia.****Münzenberger.**

Abessinien und seine Bedeutung für unsere Zeit. Aus dem Nachlasse von E. F. A. Münzenberger, herausgegeben von Joseph Spillmann, S. J. Freiburg im Breisgau, 1892: size $10 \times 6\frac{1}{2}$, pp. 161. *Map and illustrations.*

Dahomey. *Rev. Maritime et Coloniale* 119 (1893): 66-96. **Lambinet.**
 Notice géographique, topographique et statistique sur le Dahomey. Par E. Lambinet, Colonel-Commandant supérieur à Ouidah. *With sketch-maps.*

Madagascar. *C.R.* 117 (1893): 416-419. **Grandidier.**
 Les coordonnées géographiques de Tananarive et de l'Observatoire d'Ambohidempona (fondé à Madagascar, par le R. P. Colin). Note de M. Alfred Grandidier.

Mashonaland. **Bent.**
 The Ruined Cities of Mashonaland: being a record of excavation and exploration in 1891. By J. Theodore Bent, with a chapter on the Orientation and Mensuration of the Temples, by R. M. W. Swan. New edition. London, Longmans, Green & Co., 1893: size 8 × 5½, pp. xviii. and 428. *Price 7s. 6d. Presented by the Publishers.*

This edition contains references to the work of Sir John Willoughby in his recent excavations at Zimbabwe, a letter from Mr. W. St. Chad Boscawen on the hawk-symbol at Zimbabwe, which he believes to point to an Arabo-Egyptian origin of the builders of the present ruins, and two new appendices, one of which summarises the progress of Mashonaland down to May 1893, and is contributed by the Secretary of the British South Africa Company.

Mashonaland. *Scottish G. Mag.* 9 (1893): 524-530. **Don.**
 Notes of a Journey in South Africa. Extracts of a letter received by Professor Geikie from John Baylie Don, B.Sc.

Mr. Don gives some valuable notes of the geology of South Africa from the Transvaal northward to Mashonaland, and he bears testimony to the remarkable kindness and generosity of the Portuguese officials with whom he came much in contact on the borders of Manikaland.

Mashonaland, &c. **Selous**
 Travel and Adventure in South-east Africa: being the narrative of the last eleven years spent by the Author on the Zambesi and its tributaries; with an account of the colonisation of Mashonaland, and the progress of the gold industry in that country. By Frederick Courteney Selous, C.M.Z.S. London, Rowland Ward & Co., 1893: size 9½ × 6½, pp. xviii. and 504. *With numerous illustrations and map. Price 25s. Presented by the Publishers.*

This beautiful work is in every way worthy of the adventurous life and travels it describes, and, on account of its special interest, a more detailed notice of the book will be given elsewhere.

Mashonaland—Zimbabwe. **Willoughby.**
 A Narrative of further excavations at Zimbabwe (Mashonaland). By Major Sir John C. Willoughby, British South Africa Company. Illustrated. London, George Philip & Son, 1893: size 8 × 5½, pp. xiv. and 44. *Price 3s. 6d. Presented by the Publishers.*

This little book is noticed on another page.

Sahara. **Schirmer.**
 Le Sahara. Par Henri Schirmer, Docteur ès Lettres. Paris, Hachette et Cie., 1893: size 10 × 6½, pp. vi. and 444. *Avec 56 cartes et gravures et 6 phototypies. Presented by the Author.*

A valuable summary of our present knowledge of the Sahara, which will be separately noticed.

NORTH AMERICA.

North America. **Harris.**
 The Discovery of North America. A Critical, Documentary, and Historic Investigation, with an Essay on the Early Cartography of the New World, including Descriptions of Two Hundred and Fifty Maps or Globes existing or lost, constructed before the year 1536; to which are added a Chronology of One Hundred Voyages Westward, Projected, Attempted, or

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It is believed that this work will be of great utility in connection with the forthcoming discussion in Parliament regarding British East Africa.

Accomplished between 1431 and 1504; Biographical Accounts of the Three Hundred Pilots who first Crossed the Atlantic; and a Copious List of the Original Names of American Regions, Caciqueships, Mountains, Islands, Capes, Gulfs, Rivers, Towns, and Harbours. By Henry Harrisse. Paris, H. Welter; London, H. Stevens & Son, 1892: size $12 \times 9\frac{1}{2}$, pp xii. and 802.

This large and important work is profusely illustrated with maps, and will be referred to in a special article.

United States—Connecticut.

Steiner.

History of Slavery in Connecticut. By Bernard C. Steiner, PH.D. Baltimore, The Johns Hopkins Press, 1893: size $10 \times 6\frac{1}{2}$, pp. 84. Price 75 cents.

Nos. ix.—x, of the eleventh series of the Johns Hopkins University Studies in Historical and Political Science.

United States—Missouri. *T. A. Science, St. Louis* 6 (1892): 57–99.

Winslow.

The Mapping of Missouri. By Arthur Winslow, assisted by C. F. Marbut. *Maps*.

The mapping of Missouri is traced from the earliest maps of America on which the site of the state was practically a blank, with sketches of each notable step in the survey of the region down to the topographical work of the U.S. Geological Survey and of the Missouri Geological Survey, which is now preparing a map on the scale of one inch to the mile.

United States—Texas. *Ausland* 66 (1893): 555–558, 572–574.

Lerch.

Das heutige Texas. Von Otto Lerch (Austin, Texas).

CENTRAL AND SOUTH AMERICA.

Costa Rica. *Nouvelles G.* (1893): 133–137.

Fabrega.

Notes sur la Géographie du Costa-Rica. Pittier de Fabrega.

While paying a tribute to the excellence of M. Reclus' recently-published volume on the West Indies and Central America, the author offers some corrections in points of detail and matters of dispute from the Costa Rican standpoint.

French Guiana—Tumak-humak. *B.S.G. Paris* 14 (1893): 29–52.

Coudreau.

Aperçu Général des Tumac Humac. Par Henri Coudreau.

POLAR REGIONS.

Greenland. *G. Tidskrift* 12 (1893–94): 87–110.

Ryberg.

Om Erhvervs- og Befolknings-Forholdene i Grønland. Af Carl Ryberg.

Statistics of the productions of Greenland, and fluctuations in their amount for the last twenty or thirty years.

Kara Sea—Climate.

Hann.

Ergebnisse der meteorol. Beobachtungen der niederländischen internationalen Polar-Expedition 1882–83 in der Kara-See. Von J. Hann. Size $11\frac{1}{2} \times 7\frac{1}{2}$, pp. 10. Presented by the Author.

AUSTRALASIA AND PACIFIC ISLANDS.

Queensland.

Hardie.

Notes on some of the more Common Diseases in Queensland in Relation to Atmospheric Conditions. 1887–1891. By David Hardie, M.D. Brisbane, J. C. Beal, 1893: size 9×6 , pp. 132. Chart. Presented by the Chief of the Weather Bureau, Brisbane.

Victoria—Year-Book.

Hayter.

Victorian Year-Book 1892. By Henry Heylyn Hayter, C.M.G. Vol. II., Melbourne; London, Trübner & Co., 1892: size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 540. Presented by the Author.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Atmospheric Conditions.

Abbe.

Smithsonian Miscellaneous Collections, 843. The Mechanics of the Earth's Atmosphere. A Collection of Translations by Cleveland Abbe. Washington, 1891: size 9 × 6, pp. 324. *Presented by J. S. Dyason, Esq.*

Professor Abbe has brought together a judicious selection of valuable memoirs setting forth modern views on theoretical meteorology.

Bay of Biscay—Currents. *B.S.G. Com. Bordeaux* 16 (1893): 353–379.

Hautreux.

Golfe de Gascogne: Courants. Par A. Hautreux. *Sketch-maps.*

Interesting observations which will be noticed in the "Monthly Record."

Geology.

Woods.

Elementary Palæontology for Geological Students. By Henry Woods. Cambridge University Press, 1893: size 7½ × 5, pp. viii. and 222. *Presented by the Publishers.*

Lakes and Rivers.

C. R. 117 (1893): 451–455.

Faye.

Sur le *Serpent d'eau* du Rhone à Genève. Par M. H. Faye.

A study of the eddies about the sluices which regulate the outflow of the Rhone from the Lake of Geneva.

Measurement of Height. *M. k.k. militär. G. I. Vienna* 12 (1892): 61–135.

Hartl.

Vergleiche von Quecksilber-Barometern mit Siede-Thermometern. Von Heinrich Hartl.

An account of a series of elaborate comparisons of the mercurial barometer and boiling-point thermometer as instruments for measuring altitudes. Determinations of trigonometrically measured hills were repeatedly made by both methods, and the paper contains tables for the reduction of boiling-points to corresponding pressures.

Mediterranean Research. *Sitzb. A. W. Wien. (Abt. 1)* 101 (1892): 817–828.

Luksch.

Veröffentlichungen der Commission für Erforschung des östlichen Mittelmeeres. Vorläufiger Bericht über die physikalisch-oceanographischen Arbeiten im Sommer 1892 vom Meridian von Rhodus bis zur syrischen Küste. Von J. Luksch. *With sketch-map.*

Physical Geography.

Thoulet.

Introduction à l'Etude de la Géographie Physique. Par J. Thoulet, Professeur à la Faculté des Sciences de Nancy. Paris, Société d'Éditions Scientifiques, 1893: size 9 × 6, pp. iv. and 352. *Price 7fr. 50c.*

A series of lectures on physical geography has been revised and published in this book with a very happy result. Although necessarily somewhat discursive and unsystematic when viewed as a whole, the chapters gain more than they lose, and the various departments of physical geography are summarised with much freshness and picturesqueness. The order of the thirteen chapters is as follows:—Physical Geography in General, The Birth and Infancy of the Earth, The Youth of the Earth, The Earth's Maturity and Old Age, Rocks, Internal Forces of the Earth, External Agencies' Action on the Earth, The Ocean, Ice, The Place of Organised Beings in the Life of the Earth, Man, The Dawn of History, and The Races of Mankind.

Physiography.

Gregory.

Elementary Physiography: being a Description of the Laws and Wonders of Nature. By Richard A. Gregory. London, Joseph Hughes & Co., New edition, 1893: size 7½ × 5, pp. 412. *With numerous original illustrations. Presented by the Author.*

An excellent expansion of the Science and Art Department's syllabus into book-form, the work being guided, but not limited, by the official requirements. The illustrations are particularly well-chosen, so as to convey a true conception of the natural conditions described; many are from photographs by Wilson, of Aberdeen.

Solar Physics.

Verh. k. A. W. Amsterdam (1892): Pt. I.

Brester.

Théorie du Soleil. Par A. Brester Jz.

Theory of the Earth.

C. R. 117 (1893): 370-373.

Rateau.

Hypothèse des cloches sous-continentales. Note de M. Rateau.

The author seriously proposes to account for the fact that the density of the Earth's crust is greater under the ocean than under the land by the hypothesis that the continents are supported by cushions of gas given off by the heated material of the inner Earth.

NEW MAPS.

By J. COLES, *Map Curator, R.G.S.*

EUROPE.

Denmark.

Danish General Staff.

Generalstabens topografiske Kaart over Danmark. Kalkograferet og graveret ved Generalstaben Kjöbenhavn, 1893. Scale 1:40,000, or 1·5 inches to a statute mile. Sheets:—Björnsholm, Nykjöbing (Mors), Dragstrup. Presented by the Danish General Staff, through H.E. the Danish Minister.

England and Wales.

Ordnance Survey.

Publications issued since August 12th, 1893.

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Town Plans—10-foot scale :—

Blackburn (Lancashire), LXII. 11, 24, 25, 4s. each; LXII. 12, 21, 5s.; LXII. 15, 3, 5s.; 5, 8, 5s. each; 9, 8s.; 10, 8s.; 13, 5s.; 14, 5s.; 15, 11s. 6d.; LXII. 16, 1, 8s.; 2, 8s. (coloured). **Plymouth and Environs** (Devonshire), revised edition, with houses stippled, CXXIII. 3, 11, 12, 16, 17, 22, 23, CXXIII. 7, 2, 3, 4, 8, 10, 11, 12.

(*E. Stanford, Agent.*)

ASIA.

Central Asia.

Constable and Stanford.

Map of the North-western Frontier of India, showing the Pamir Region and part of Afghanistan. Scale 1 : 2,000,000, or 31·1 statute miles to an inch. London: Archibald Constable & Co., and E. Stanford. *Presented by E. Stanford.*

All the most recent information has been used in the compilation of this map, which embraces the whole of the Pamir and adjacent countries, and the boundaries as far as they have been settled are correctly laid down. The style of drawing employed is good, the hills being shown in brown, rivers and glaciers in blue, and the map is not overcrowded with names. The whole effect is pleasing and conveys an accurate idea of the topography of this region.

China.

Waeber.

Map of North-eastern China. By Charles Waeber, 1893. Scale (centl.) 1 : 1,355,000, or 21·3 statute miles to an inch. A. Ilyin, Geographical Establishment, St. Petersburg. 4 Sheets. *Presented by the Author.*

The area included in this map is from latitude 30° N. to 43° 20' N., and longitude 112° E. to 125° 22' E. It is drawn on Mercator's projection. A table explaining the signification of the symbols used to denote the importance of towns, native terms, and abbreviations is given. The hills are shown in brown, and the water in blue; all the principal roads and canals are laid down, and the boundaries of the provinces, and the Mongol clans are clearly indicated. It would appear from the letters and numbers on the margin that it is intended to be used with an index, but in the present instance this has not been presented with the map.

AFRICA.

Mashonaland, Matabililand, &c.

Stanford.

A Map of Mashonaland, Matabililand, Khama's Country, &c. The British South Africa Company's Territory South of the Zambesi, 1893. Scale 1 : 1,000,000, or 15·8 statute miles to an inch. London, published by Edward Stanford, 1893. *Presented by the Publishers.*

This map has been compiled from all the latest sources. No attempt has been made to show the relief; but in other respects it indicates the present state of our geographical knowledge of this part of Africa. Notes having reference to the character of the country and the rivers are given, as well as figures indicating elevations above sea-level. The scale is sufficient to admit of a large amount of detail being shown, and goldfields, means of communication by road, rail, and telegraph, are laid down. The want of a good map of this region has long been felt, and the appearance of this, at a time when so much attention is directed to Mashonaland, is most opportune.

North Africa.

Duveyrier.

Itinéraire de Telemsân à Melila. Par H. Duveyrier, 31 Mai-10 Juin, 1886. Scale 1 : 360,000, or 5·7 statute miles to an inch. Bulletin de la Société de Géographie. 2^e trimestre 1893. *Presented by the Société de Géographie, Paris.*

Nyasa.

Wissmann.

Originalkarte des Nord-Ost-Ufers des Nyasa-Sees. Nach eigenen Aufnahmen gezeichnet von Major H. v. Wissmann, 1893. *Petermanns Geographische Mitteilungen.* Jahrgang, 1893. Taf. 14. Justus Perthes, Gotha. *Presented by the Publisher.*

Somali Land.

Robecchi-Bricchetti.

Itinerario de Viaggio da Obbia ad Alula dell' Ing^{re} Luigi Robecchi-Bricchetti. Scale 1 : 500,000, or 7·8 statute miles to an inch. 3 sheets. *Presented by the Author.*

South Africa.

Philip.

Southern Africa, including the Cape Colony, Natal, South African Republic, Orange Free State, Bechuanaland, Matabeleland, &c. Scale 1 : 3,900,000, or 61·5 statute miles to an inch. London, George Philip & Son, 1893. *Price 1s. Presented by the Publishers.*

This is a handy little map for general reference, on which the present state of railway communication is laid down. It would, however, have been more useful if it had been extended to the east, as far as the mouths of the Zambesi, showing the new Beira railway, and marking the limits of the British South Africa Company's territories.

AUSTRALASIA.

German New Guinea, &c.

Deutsche Kolonialgesellschaft, Berlin.

Kaiser Wilhelms Land und Bismarck Archipel. Scale 1 : 1,000,000, or 15·7 statute miles to an inch. Deutsche Kolonialgesellschaft, Berlin. In Kommission bei Carl Heymanns Verlag. 1893. 4 sheets. *Presented by the Deutsche Kolonialgesellschaft, Berlin.*

The results of all recent surveys are shown on this map, which differs in some respects from those previously published. This is especially the case with regard to Neu Pommern, which is taken from the surveys of Vice-Admiral von Schleinitz. The map is drawn in a bold style, and the lettering is clear.

POLAR REGIONS.

Arctic Ocean.

Jenkins.

Petshora Bay and Kara Sea. (Norway and Lapland, Supplementary Sheet A).—Gulf of Obi and River Yenisei. (Norway and Lapland, Supplementary Sheet B). Compiled by H. D. Jenkins, F.R.G.S. On one sheet. Published by James Imray & Son, London, 1893. *Presented by the Publishers.*

GENERAL.

The World.

Vidal-Lablache.

Atlas Vidal-Lablache, Maitre de Conférences de géographie à l'École Normale Supérieure. Histoire et Géographie. 137 Cartes, 248 Cartons. Index alphabétique de plus de 40,000 noms. (L'Atlas complet paraîtra en 24 livraisons). 21^e Livraison. Paris: Armand Colin et C^{ie}, Éditeurs. Price 1 fr. 25c. each part.

This part contains a geological map of India, maps of the Chinese Empire, Japan, physical and political maps of Africa, and a map of South Africa. As usual with this atlas, each part is accompanied by explanatory letterpress.

The World.

Kiepert.

Kiepert's Grosser Hand-Atlas. Neue Lieferungs-Ausgabe in 45 Karten. Ausgabe in 9 Lieferungen à 5 Karten mit statistischem Material und Namen-Verzeichniss mit Bevölkerungsziffern zu jeder Karte. Die statistischen Angaben von Dr. Paul Lippert, Bibliothekar des Kgl. Preuss. Statist. Bureau. Dritte, in Zeichen-Institut der Verlagshandlung unter Leitung von Dr. R. Kiepert. Teils vollständig neu bearbeitete, Teils gründlich berichtigte Auflage. Berlin, 1893. Geographische Verlagshandlung Dietrich Reimer. Inhaber: Hofer & Vohsen. Parts III. and IV. Price 4 M. each part. Presented by the Publishers.

Part III. contains general maps of Europe, Brandenburg, Silesia, and Posen, Spain and Portugal, European Russia, Australasia and Polynesia. Part IV. contains maps of Bavaria, Wurtemberg, Baden, Elsass-Lothringen, Pomerania, West and East Prussia, Central Italy, Netherlands and Belgium, and England. Each map is accompanied by an index and letterpress.

The World.

Johnston.

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Part 24. W. & A. K. Johnston, Edinburgh and London. Price 4s. 6d. each part. Presented by the Publishers.

This part contains maps of Abyssinia and Upper Nubia, and the southern sheet of a map of South America, with an index for each map.

PHOTOGRAPHS.

Baluchistan.

Survey of India Offices.

View showing Distortion of Rails caused by Earthquake between Sanzal and Old Chaman. Photo-etching. Survey of India Offices, Calcutta, April 1893. Presented by Lieut.-Colonel J. Waterhouse, B.S.C.

This is a photo-etching, showing the remarkable manner in which a railway-track has been distorted by the effects of contraction of the land, caused by an earthquake in Baluchistan.

British East Africa.

Railway Survey Party.

Seventy-one Photographs taken by the Mombasa-Victoria Nyanza Railway Survey Party, 1892. Presented by Captain J. W. Pringle, R.E.

This is a very interesting series of views, taken by the Mombasa-Victoria Nyanza Railway Survey Party. They contain some scenes of great beauty, together with interesting photographs of the different native tribes.

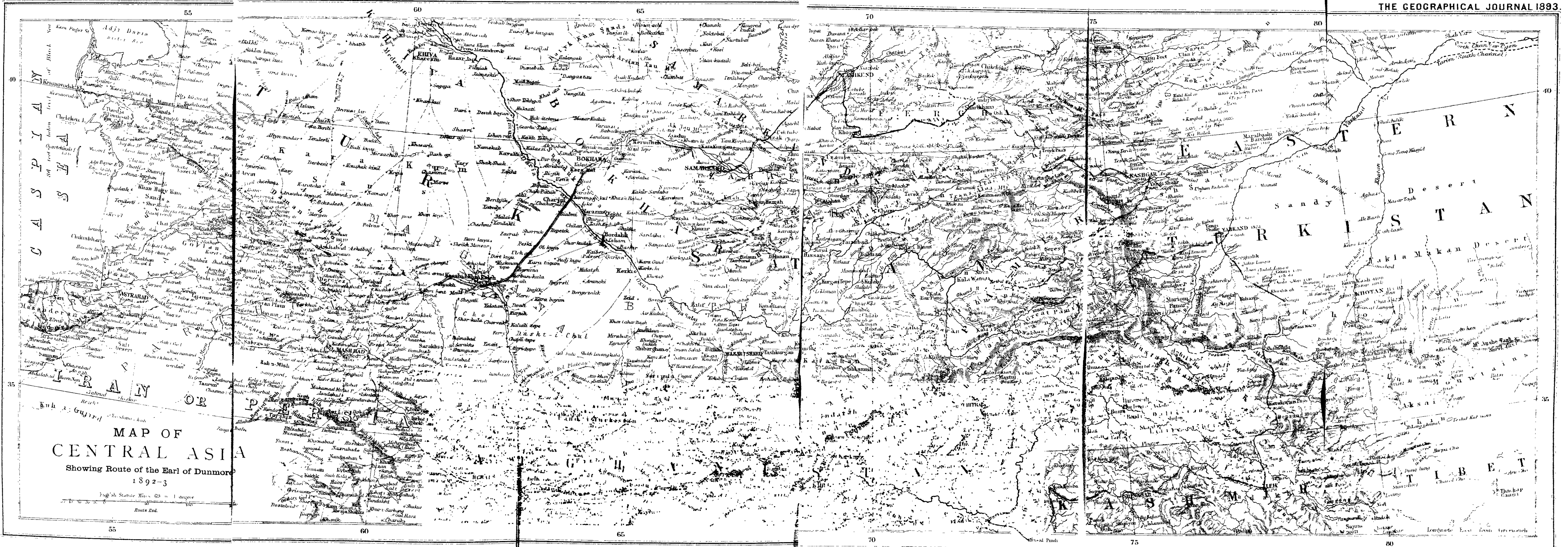
Transvaal.

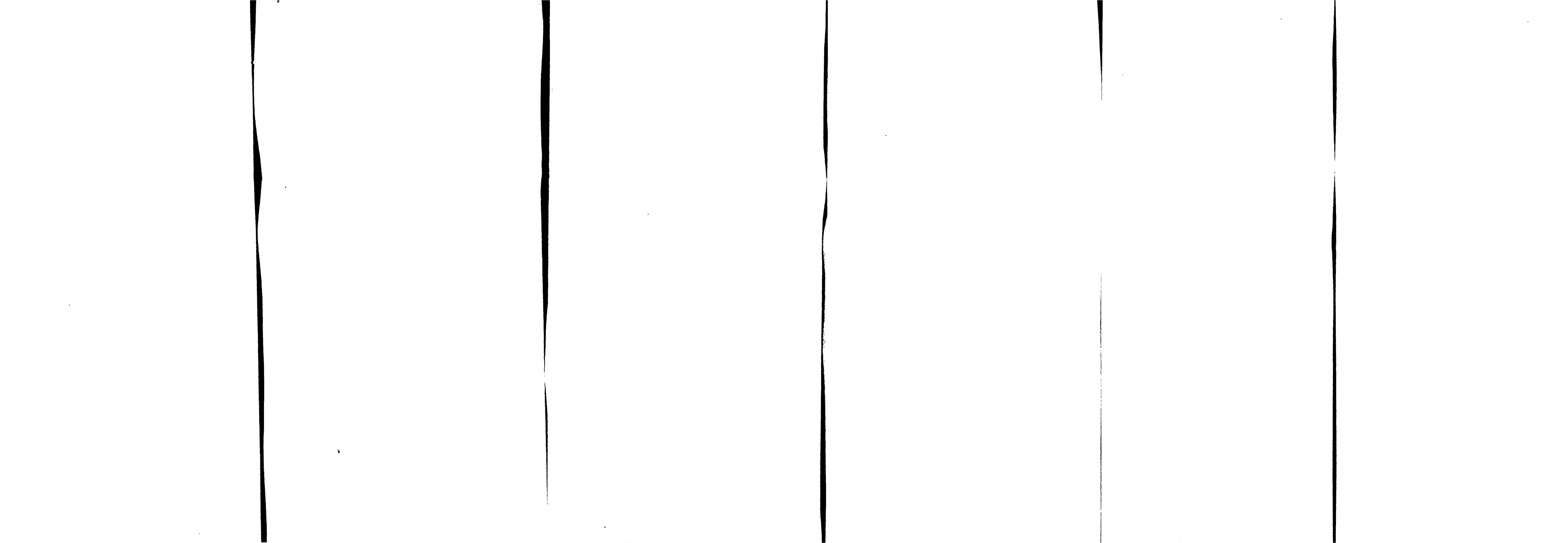
Gros.

Twenty-Three Photographs of the Transvaal, taken principally by H. F. Gros. Presented by E. Jepp.

This set of photographs shows the scenery and life in the veldt in the Transvaal. Among the more interesting are Zoutpansberg Katir chiefs, a native iron foundry, gold-diggers' quarters, and a view of Woodbusu, Zoutpansberg.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





Plotted from Compass Bearings
on Astronomical positions by Com^d Keane & Consul H.E. O'Neill.

Author's routes.

The Geographical Journal.

No. 6.

DECEMBER, 1893.

VOL. II.

THE PRESENT STANDPOINT OF GEOGRAPHY.

OPENING ADDRESS OF THE PRESIDENT, MR. CLEMENTS R. MARKHAM,
C.B., F.R.S.*

THE work of geographical discovery, during living memory, has proceeded with such rapidity that many of us have been half inclined to think that there is little left to be done. Brilliantly successful expeditions have traversed the unknown parts of the great continents, blank spaces on our maps have been filled up year after year, entrancing narratives of perilous adventure have held us in rapt attention during each succeeding session, until we are tempted to believe that the glorious tale is nearly told. But this is very far indeed from being the case. There are still wide tracts, in all the great divisions of the Earth, which are unknown to us, and which will furnish work to explorers for many years to come; while the examination of ocean depths is an important task which has but lately been commenced. Moreover, there are regions of vast extent which are only very partially known to us, the more detailed examination of which will enable explorers to collect geographical information of the highest value and of the greatest interest. It is from the methodical study of limited areas that science derives the most satisfactory results. When such investigations are commenced it is found how meagre and inaccurate previous knowledge derived from the cursory information, picked up during some rapid march, had been. A detailed scientific monograph on a little known region of comparatively small extent supplies work of absorbing interest to the explorer, while he has the satisfaction of knowing that his labours will be of lasting value and utility. There is sufficient work of this less ambitious, but not less serviceable kind to occupy a whole army of field geographers for many decades. Exact delineation, by trigonometrical measurement, is our crowning work. It is barely commenced. With

* Delivered at the Meeting of the Royal Geographical Society, November 13th, 1893.
No. VI.—DECEMBER, 1893.]

the exception of countries in Europe, British India, the coast of the United States and a small part of its interior, the whole world is still unmapped. Supposing that the surface of the Earth does not undergo changes, our work will be completed centuries hence when all the regions of the Earth have been discovered, have been explored in detail, and have been scientifically mapped. As the Earth's surface is in constant process of change our work will never be completed, and we must, as a race of men, labour at it without ceasing. We of this generation have received the torch of geographical knowledge from our fathers. It is for us to diffuse its light over a wider and wider circle while we live, and to hand it on, still burning brightly, to our descendants.

All of us, all the Fellows of this great Society, ought to work in our several lines and capacities ; for all can help in the diffusion of the light of knowledge, some in one way some in another. I have thought, therefore, that we might usefully set apart the opening night of our present session for taking a survey, it must necessarily be a rough and incomplete survey, but still a general survey of some of the work that is before us ; of the regions that are still unknown and await discovery, of the tracts that seem most to need more detailed exploration, and of the principal geographical problems that remain to be solved. We may also glance at the ways in which our Society has furnished in the past, and may still more in the future furnish, aid towards furthering and helping in the great work that is always before us.

The Polar areas contain by far the most extensive unknown tracts on the globe. Explorers and geographers have been occupied with the Arctic regions for the last three centuries, and more especially during the last century. Their labours have added a very bright page to the story of British maritime achievement. The expeditions have brought back abundant valuable results in all branches of science, and by opening the way to lucrative fisheries, have increased the wealth of the nation. But their great use has been that to which Lord Beaconsfield referred in 1874, "the importance of encouraging that spirit of enterprise which has ever distinguished the English people." At present it is our watch below as regards the Arctic regions. We have taken a back seat, from which we look on while others do the work. Mr. Peary, after a very perilous and adventurous reconnaissance last year, is now preparing, amidst all the hardships of an Arctic winter, for a supreme effort to solve one of the great remaining geographical problems, the insularity of Greenland. Our gallant friend Nansen is engaged upon a still more heroic enterprise. I believe that the argument on which his proceedings are based is sound. I know that if thorough knowledge, mature reflection, courage of the highest order, indomitable perseverance, and the faculty for command can secure success, Nansen is the man to achieve it. But the natural obstacles are very great, and it may well be beyond human power to overcome them. We can only give these

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gallant men our warmest sympathy, and resolve that our welcome on their return shall be hearty and cordial.

But even when the great geographical problems with which Nansen and Peary are now grappling have been fully solved, there will still be a vast unknown area within the Arctic circle, and much important work to be done. For several reasons I believe that there is land between Prince Patrick Island and Siberia which ought to be discovered. The extent of the ancient ice ought to be ascertained by an expedition up Jones Sound. Franz Josef Land, particularly the coasts and islands on its northern face, offer materials of peculiar interest to the explorer. Mr. Jackson, who left last summer to explore the Yalmal Peninsula, has proposed to lead an expedition in this direction. The difficulties will be formidable and ought not to be disguised, but the value of the scientific results to be attained are well worth the unavoidable risk. Another direction for research is the area immediately to the north of Cape Chelyuskin in Siberia, where Lieutenant Hovgaard, on plausible grounds, believes that there is extensive land. It will occupy at least five successive Arctic expeditions, all entirely successful, to complete our knowledge of the North Polar area, and this Society ought never to rest satisfied until the work is thoroughly done. For it must be borne in mind that this work will not only unfold to us the varied phenomena of the unknown regions. The Earth's surface is a connected whole, and its phenomena are inter-dependent. For example, the climate of Europe, as was pointed out in 1873, in no small degree depends on the atmospheric conditions of the Polar area. For the satisfactory appreciation of these phenomena a precise acquaintance with the distribution of land and water north of the Arctic circle is quite necessary; and of that our knowledge is still very limited.

If a vast extent of the North Polar area is still unknown, and if, as is undoubtedly the case, its complete examination is a scientific desideratum, how much more is this the case within the South Polar area? The Antarctic regions, with millions of unknown square miles full of geographical work, and teeming with the most interesting scientific problems, have been totally neglected by us for half a century. It is not necessary that I should say more, because at our next meeting Dr. John Murray will address us fully on the important results to be derived from Antarctic discovery, and stir up our enthusiasm as geographers and our patriotism as Britons, so that we may all combine in a hearty effort to procure the renewal of Antarctic research. Certainly fifty years is a long time for us to have totally neglected so vast and so important a field for geographical discovery. We may now look forward to a most interesting Antarctic meeting on November 27th, and, meanwhile, we will continue our survey of the other parts of the world, which either need further exploration, or are entirely unknown.

There is plenty of interesting work even in *our* quarter of the globe,

although there are now no discoveries to be made. Even in our own islands some of the lakes are unsurveyed, and were not systematically sounded until our accomplished librarian began the useful work in Cumberland this year. The topography of the Alps may be considered to be fairly complete, but there are still physical enquiries of great interest which commend themselves to scientific Alpine travellers, such as the extent and action of ice, the oscillations of glaciers, the origin of the Föhn wind, and the effects of the destruction of forests. The historical geography of the Alps is also in process of elucidation; and in this department our associate, the Rev. W. B. Coolidge, of Magdalen College, Oxford, is one of the most industrious workers; but much remains to be done. It will be remembered, too, that our secretary, Mr. Douglas Freshfield, has written a paper on the long-disputed passage of the Alps by Hannibal, and, although his solution of the question has not been universally accepted, it is adopted in the latest edition of Arnold's 'Rome.' Beyond the Alps there is need of a fuller description of the Cantabrian Highlands along the north of Spain; but it is the Balkan Peninsula which offers the best new ground in Europe for mountain travellers. This year our Oxford travelling scholar, Mr. Cozens-Hardy, has been investigating one of the least-explored and worst-mapped regions in Europe, that on the frontiers of Montenegro. The value of his work is best shown by the fact that the Intelligence Department have undertaken the production of a map based on his observations. On the borderland of Europe and Asia the Caucasus has been revealed to us, and we have been made familiar with the splendour of its forests and frozen crests, within the last quarter of a century, thanks to our Gold Medallist, Dr. Radde, and other Alpine climbers. In this region Signor W. Sella, our honorary associate M. de Déchy, and Mr. H. Woolley have conspicuously proved what photography can do to present a living picture of the physical features, and of the inhabitants of a hitherto little known country. Recently the Russian Government has undertaken a survey of the Caucasus, and the results, as far as they are available, reflect the highest credit on the officers employed; but the range is of great extent, and here there is plenty of room for mountain travellers to break new ground.

The regions not yet traversed by explorers on the continent of Africa have shrunk very considerably since I became a Fellow of this Society. Barth and Vogel were then at work in the direction of Timbuktu and Lake Chad, Dr. Baikie was on the Niger, Dr. Livingstone was making his way to the coast at Loando, and Mr. Galton's companion, Anderssen, had reached Lake Ngami, Burton had just proposed his expedition to Harar. Tanganyika, Victoria Nyanza, and Nyasa, the falls of the Zambesi, the heights of Kilimanjaro and Kenia had not been heard of. In those days almost every expedition that was sent into Africa revealed to us some geographical feature of commanding importance, corroborating or refuting the theories and speculations of students.

At present there are only three regions—in Africa—of considerable area, which offer opportunities for discovery on a large scale, namely, the Sahara, the region adjoining it to the south, and extending across Wadai to the watersheds of the Congo and Nile; and the region to the east of the Upper Nile, stretching south of Abyssinia, through the lands of the Gallas and Somalis, to the eastern seaboard of the continent.

In the Sahara there are more especially two districts which would reward an enterprising explorer. One has for its centre the highlands of Tibesti, for our knowledge of which we are solely dependent on the reports of Nachtigal and Gerhard Rohlfs. The other is the highland of Ahaggar. Colonel Flatters lost his life in an attempt to explore it in 1881, yet the difficulties cannot be insurmountable. Great interest attaches to a thorough examination of the Atlas mountains, but they are still rendered inaccessible, in some parts, by fanatical tribes.

The second large unknown African region includes Wadai, and the districts lying between the scene of Junker's exploration in the east, and the route recently taken by M. Maistre, in his journey from the Ubangi to the Shari. Wadai has only been visited by three Europeans. Dr. Vogel was murdered at Wara in 1856, and his diaries have never been recovered. Nachtigal crossed the country from west to east in 1873. Lieutenant Masari did so in the opposite direction in 1880. A European traveller would doubtless meet with considerable difficulties in an exploration of Wadai proper, but the outlying districts of this region certainly deserve attention, and they are now much more easily accessible from the Ubangi-Welle or the upper Benue, than they were some years ago.

Far more interesting, however, is the vast region, the greater part of which is unexplored, which stretches from the Upper Nile to the Indian Ocean. It includes not only the territories of the Galla and Somali, but also those highlands to the south of Abyssinia, where little progress has been made since the visit of D'Abbadie to Kaffa in 1843. There are commercial, as well as geographical motives for opening up these almost unknown highlands. When I was at Senafé, in Abyssinia, a merchant arrived from Kaffa or Enarea, with donkeys laden with coffee. I had an interesting conversation with him, Dr. Krapf acting as my interpreter. The man said that he had crossed the whole of Abyssinia to find a market for his goods, and that he was on his way to Massawa. We afterwards heard that he was robbed and murdered in the Dagonta Pass: so that he never reached his market. This incident has always given me a special interest in the highlands south of Abyssinia; and parts of them have recently been visited by Italian travellers. Chiarini and Cecchi made their way from Shoa to Kaffa, Soleillet reached Kaffa in 1882, Borelli explored the sources of the Hawash in 1888, and reached the Omo flowing to Lake Rudolf, and Dr. Traversi examined the upper Hawash, and Dr. Stecker reached Lake Zuway. The interesting lake district to the south of Shoa is probably most accessible

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from the north. But assaults should be made on the southern extremity of the great Abyssinian mountain plateau from the east or the south, by expeditions starting from Kisimayu or Lake Rudolf. Mr. Chanler, with Lieutenant Hühnel, and Captain Bottego, who are at present in the field, may possibly solve the problem of the sources of the Jub, but even if they do succeed, there will still remain splendid opportunities for future expeditions.*

The Italians have recently made great efforts to ascertain the geographical features of the Somali country. Signor Bricchetti-Robecchi, especially, has travelled along the whole coast from Mukadisho to Allula, and has also crossed the Somali country, from Obbia on the shore of the Indian Ocean to Berbera on the Gulf of Aden. We had the pleasure of welcoming this ardent explorer in the autumn. He had previously written a charming book describing his visit to the oasis of Jupiter Ammon.

The country west of the Jub lies within the British sphere of influence, and the interests of geography, no less than those of commerce, make it desirable that its exploration should be undertaken by British travellers. As soon as friendly relations can be established with the Somali and Galla living at the back of Kisimayu, an expedition into the country of the Borana Galla ought not to meet with insuperable difficulties. Camels, horses, and donkeys are procurable there, so that the work of explorers would be much facilitated. A depot might be established on or near Lake Rudolf, a district which is said to be rich in ivory, and relations might thence be established with the tribes intervening between that lake and the highlands south of Abyssinia, including Kaffa and Enarea. Exploring journeys both from the Shoa country to the south, or northwards from Lake Rudolf, would lead to a region which, although the last to be taken in hand, is certainly one of the most interesting in the interior of Africa.

Outside the regions just referred to, we may be said to have obtained a fair knowledge of the general geographical features of the African continent. Much detail remains to be filled in, and much of the work, executed in a hasty and superficial manner, requires to be done over again. There are also regions of great interest which have been visited, but which will well repay detailed examination. The mountains of Ruwenzori were discovered by Stanley, and have since been passed, on the west side, by Stuhlmann. Captain Lugard, whom you had the pleasure of welcoming from Uganda in the last session, was the first to pass them on the eastern side. These mountains, and the country between them and Lake Tanganyika, comprise a piece of work which Mr. Scott Elliot has just set out with the intention of

* Captain Bottego has since returned to Europe. An account of his expedition will appear in the next number of the Journal.

carefully executing. Most valuable results may, I think, be anticipated from his labours.

Excellent work of the same character has just been completed by our correspondent, Dr. Gregory, on Mount Kenia, and we may anticipate a most interesting paper from this accomplished explorer in the course of the Session.

Many of the itineraries which crowd and fill up our maps, are based upon very imperfect materials. Mr. Ravenstein, whose unrivalled knowledge of all that concerns the mapping of Africa is well known, has pointed out to me the want of reliable scientific observations even on routes which have been traversed several times. It is not possible to lay them down on a map with any confidence, in consequence of these deficiencies. The Victoria Falls of the Zambesi, for instance, have been visited by scores of travellers, but their exact geographical position is still uncertain. Careful astronomical observations have never been taken there. Then again the statements as to the height of Lake Ngami above the sea, actually vary between 2260 and 3700 feet. The Tioje, which enters that lake on the north, has been repeatedly ascended, but observations for latitude have never been taken. Similar instances of opportunities neglected might be adduced from all parts of Africa, the most deplorable one being that of the now abandoned Egyptian Sudan, where an extensive net of telegraphic wires was never utilised for determining the longitudes of Khartum and other places of importance.

On the other hand, we must remember the admirable work done by our distinguished gold-medallist, Mr. O'Neill, in fixing the position of Blantyre. Equally careful observations have been taken by the Belgian officers in the Basin of the Congo and on the shores of Lake Tanganyika. Nor must I fail to record the good work of the members of the Anglo-Portuguese, Anglo-French, and Anglo-German Boundary Commissions; and of the officers of the Royal Engineers who carried out the surveys for a proposed Mombasa-Victoria railway. We must recognise established facts. It is the work of scientific and carefully-trained explorers that we now need in Africa. The time for desultory exploring expeditions is past. Some parts of Africa, including Algeria and Tunis, Cape Colony, Natal, and Eritrea are now actually being surveyed. An extension of such surveys, on the system proposed by Colonel Trotter at the Cardiff meeting of the British Association, to other districts already occupied by Europeans, is much to be desired. In the end they would prove cheaper than repeated expeditions yielding imperfect or unreliable materials for the map-maker.

Their extension over the greater part of Africa cannot of course be thought of for many years to come. But I believe that it would be quite possible to drive certain carefully selected trunk lines across the continent, which would serve as bases for all future exploration,

and which would enable us to utilise existing materials far more efficiently than can be done at present. The positions of the main stations on these trunk lines would be carefully fixed by astronomical observations; and there should be a number of meteorological stations supplied with standard barometers, so that we may be able to compute our aneroid observations with some confidence in the results.

Such is the work of the future as regards the African continent. There are two great areas of the Sahara to be discovered. There is Wadai to be explored. We hope that a well-equipped English expedition will, before very long, set out from a base on Lake Rudolf, and penetrate the highland region south of Abyssinia. We also hope to receive much valuable geographical information from the contemplated work of the Hausa Association. There are numerous pieces of local exploration, such as the work undertaken by Mr. Scott Elliot in the Ruwenzori, which are both interesting and important. Lastly there is the establishment of lines of fixed positions and of meteorological stations which ought to be kept steadily in view by us, and pushed forward as opportunity offers. This is the pioneer work which will keep well in advance of regular surveys. The pace of African discovery, during my time, has been fast and furious. Hereafter it will be more steady, and the work will be more scientific. We are proud, as a nation, of the illustrious men who, in the face of appalling sufferings and hardships, and in spite of what might well appear insuperable difficulties, have supplied us, in a comparatively short number of years, with a general knowledge of the interior of Africa. We shall have to ask for equally high qualifications as travellers from those who will, in the future, emulate the examples of Livingstone and Burton, of Speke and Grant, of Cameron and Stanley; and also for scientific attainments of a high order. That the right men will come to the front—who can doubt? Some indeed are already in the field. We must not, however, forget the warning voice of my illustrious predecessor, Sir Bartle Frere. “No country,” he said, “possesses the best raw material in such perfection as Great Britain. The strong physical constitution, the buoyant energy, the keen power of observation, the good-humoured indifference to opposition and danger, the determination not to be beaten, are more common among our youth, more lasting among our seniors, than in most other races. But this very abundance of natural gifts is apt to give us a dangerous contempt for artificial culture. How often have our working geographers lamented the neglect of systematic training by some of our most enterprising travellers.” These wise words were addressed to you twenty years ago, and I believe that they were taken to heart. Our young explorers now pay much more attention to their scientific training than they did formerly. There is plenty of important work, and plenty of very hard work in Africa still; and I am confident that Britain will produce the right men to do it, and to do it well. If there are sucking Wellingtons

and Nelsons among us, there are also sucking Burtons and Livingstones. The magnificent raw material surrounds us; and the men who possess the physical advantages enumerated by Sir Bartle Frere, will surely add to them the needful scientific knowledge, when they find that it is thus that they must qualify to become good explorers. As our country has produced great African travellers in the past, so she will send them forth in the future. As long as there is work to be done, I say again that there will be no lack of volunteers.

In the continent of Asia British geographers have been very active during the present century. They have made a trigonometrical survey of India, and we know what those few words signify, what high scientific attainments were required, what hardships and dangers had to be encountered, what heavy loss of life was entailed, and we also know how fruitful were the results. The names of Rennell, of Everest, of Waugh, of Montgomerie, and of our eminent colleagues Generals James T. Walker and Sir Henry Thuillier, will for ever occupy very honourable niches in our geographical temple. British explorers have also surveyed and mapped Mesopotamia and Syria, Persia and Afghanistan, they have navigated the Chinese rivers, penetrated over the passes of the Himalaya, traversed the deserts of Manchuria and Turkistan, and discovered the source of the Oxus. Still they have left a great deal for their successors to do.

Perhaps the most interesting and important unknown Asiatic region is the southern part of Arabia, from Yemen on the west to Oman on the east, and between the sea-coast and the states of Nejd in the interior. This unknown region is upwards of 450 miles in extent, both in length and breadth. Hadramaut, with its lofty mountains and cultivated ravines, its settled population and historic past, is almost a sealed book to us. The little we know is derived from the narrative of journeys made by Baron von Wrede in 1843, and from the more recent excursion of Colonel Miles in 1870. Wrede's stories of Himyaritic inscriptions, will mountain passes, mysterious quicksands, and terraced cultivation only quicken our longing to know more. Hadramaut, like the Antarctic continent, has been totally neglected by us for half a century. I am happy to be able to announce to you that our accomplished associates, Mr. and Mrs. Bent, accompanied by a Mohammedan surveyor from India and other assistants, are about to undertake the exploration of this practically unknown region. The excellent work they have already accomplished gives us the assurance that when we welcome their return we shall find that they have brought back a rich store of valuable and interesting information.

Leaving Arabia and Syria, we find much work yet to be done in Asia Minor. The most important unexplored field includes the upper valley of the Euphrates and Eastern Cappadocia, and towards this part of the work our Society has already made a liberal contribution. Next,

turning our attention to Persia, we come to a country which has been explored and reported upon by many of our countrymen since the days of Sir John Malcolm, and which has now, thanks to our colleague, Mr. Curzon, been admirably mapped. Yet even here, as I am informed by Mr. Curzon, plenty of useful geographical work remains to be done; while a good deal of information that has been collected by officers despatched by the Intelligence Department at Simla continues to be "secret and confidential." Thus there are several gaps which it is in the power of private travellers to fill in, so that Persia still affords an interesting and far from exhausted field for geographers.

Entering from the west, although the frontier province of Azerbaijan has, in its northern half, been systematically explored and mapped by Russian surveyors, in its southern parts and on the Turkish border attention might usefully be paid to the Persian Kurds, both nomad and sedentary, the former mostly in the mountains, the latter in the triangle of which the three points are Suj-Bulah, Bijar, and Sinna. Farther south, Luristan still remains unexplored in many parts, especially in the western subdivision called Pusht-i-Kuh, the home of the Feili Lurs. Since Sir Henry Rawlinson and Sir A. Layard were there fifty years ago these regions have been almost unvisited. Again, to the west of the route, from Tehran to Ispahan, there is a number of small districts which are very imperfectly known; while west of the road from Ispahan to Shiraz there is an absolute blank on the thirty-third parallel, between Kumishah and Yezd. Farther south, the Basha-kerd province and Persian Baluchistan are very little known and largely unexplored, and in Luristan there is a blank space on the maps between the coast range and the caravan route from Faizabad to Lar. So that it will be seen that there is a great deal to which a young geographer might devote his energies in Persia. The same may be said of Baluchistan, where, between Kharan and the Mekran coast, except along the old Kafilah route from Lus-Bela to Panjgur (which was traversed by Sir R. Sandeman in 1890), the map is almost a blank.

Parts of Afghanistan are very dangerous for Europeans to be employed in, and our knowledge of the mountain-ranges between Kabul and Herat, which are occupied by the Hazara and other tribes, is most inadequate. Our ignorance of Kafiristan is complete. We still know nothing whatever of that interesting country, and its exploration is very desirable. Officers have been on its frontier—Colonel Tanner on the side of the Kunar River, my old friend, Sir William Lockhart, on the north, and the late Mr. McNair from the side of Chitral. But the country itself, from the passes of the Hindu Kush to the banks of the Kunar, is unknown. Its exploration is one of the great geographical achievements that remain to be done in Asia. The results would be important both from a political, a geographical, and possibly a commercial point of view, and there could be few nobler ambitions for a

young aspirant than to be the first explorer of Kafiristan. In Southern Afghanistan much also remains to be done, as, for instance, in the tracts to the west of the British frontier, between the Zhob and the Kurram valleys.

The Pamir table-land has been largely explored by several European travellers; but there is plenty of room for further work, and a systematic survey of the whole region would be a valuable contribution to geography. Further to the east the plains of Turkistan have been elaborately explored, and are sufficiently well known. The mountains and hills to the south, however, being spurs from the Mustagh-Himalayan ranges, are very imperfectly understood. It is doubtful, for instance, whether the Yarkand River, which rises in those ranges, flows some distance westward before it enters the plain, or whether it breaks through the mountains 30 or 40 miles to the east, and proceeds direct to Yarkand. A fairly accurate survey of the northern slopes of the Himalayan ranges and the adjoining portions of Eastern Turkistan is much needed, although a great deal of good work has quite recently been executed in the loftier parts of those ranges.

The recent journey of Mr. Conway among the glaciers and higher passes of the Mustagh-Himalayas is an example of what the courage and skill of an able private explorer may do under the most difficult circumstances. Starting from Hunza and Nagar, he surveyed a considerable area of country at great altitudes, and he has been able to correct and add to the survey of this region, which was executed by Colonel Godwin Austen. Fellows of the Society have already listened to Mr. Conway's graphic narratives, and before long his painstaking and minutely accurate map of one of the most remarkable portions of the Himalayan glacier region will be in your hands. In the same region, but still further north, officers of the Indian Survey are pushing their observations, and we may hope in due time to be furnished with the results. Another surveyor, Mr. Senior, has done much valuable work under circumstances of unusual difficulty, among the higher ranges of Kula and Lahaul. His merits have been recognised by our Council, and he has been awarded our Murchison Grant.

Further to the east, along the Himalayan chains, the kingdom of Nepal covers a tract of country about 500 miles long and 100 miles broad, lying between the crests of the mountains and the British frontier. This is still almost a blank upon our maps. Europeans, except a few officers at the capital, are debarred by treaty from entering Nepal, so that the country is very imperfectly known. The passes from Nepal into Tibet have a special interest for us, because the only great army that has invaded India since the commencement of British rule in Bengal marched through one of them—the Kirong Pass—and so descended from the valley of the Tsanpo into Nepal. It has never, I believe, been visited by any European.

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Lhasa, the capital of Tibet, has never been visited by any Englishman since the days of Manning. There is also a vast and wholly unexplored region of Tibet on the north-west, between the parallels of 34° and 36° and the meridians of 82° and 90° . It lies between the explorations of Captain Bower on the south side, and those of Colonel Pevtsof and M. Bogdanovich on the north. In south-west Tibet there are also great belts of unknown country between the routes of Pundit Nain Sing from Ladak to Lhasa, and his route along the upper course of the Yaro-Tsanpo River; also between that river and the crests of the Himalayan ranges, which form the border of Western Nepal. The course of the Tsanpo and the adjoining country on both banks are well known as far as the meridian of 93° , and fairly well, but with some uncertainty, to $94^{\circ} 10'$. But from that point down to its entrance into the Assam Valley, under the name of the Dihong River, it is wholly unknown. So also is the country eastwards up to the meridian of 97° —a region which is probably the basin of the tributaries of the Dibong River, which flows into the Lohit-Brahmaputra a few miles above the point where the latter river joins the Dihong or Tsanpo.

The great rivers of Central and Eastern Tibet—the Giamo-Nu-Chu, the Lantsan, and the Di-Chu—are fairly well known in parts; but there are considerable portions of the first river, more particularly, which need further exploration. There is considerable uncertainty whether, below where there is a ferry on the road from Dayul to Kima, the Giamo-Nu-Chu flows southward as the source of the Salwin, or south-westwards, and is the principal source of the Irawadi. This is a geographical problem of great interest, and offers a splendid opportunity for ambitious young explorers to win their spurs. This whole region of complicated mountain and river systems, which still conceals the sources of the great Burmese streams, urgently calls for bold and hardy explorers to disentangle it. It is the borderland of several races, mostly broken up into minute tribal divisions, which present the same interest to the anthropologist as their country does to the geographer.

In Burma itself much information is still needed to complete our knowledge of its geography; but this desideratum is being systematically attended to by the Indian Survey Department. In Siam Mr. McCarthy has recently constructed a map, and the trade routes between Chieng Mai and the Upper Mekong have been traversed by Holt Hallett, Carl Boch, Archer, and others. But the region lying to the south, between the Menam Valley and the Lower Mekong is almost unknown to Englishmen. A thorough acquaintance with the country on the western side of the Mekong is very desirable: such as the cis-Mekong parts of Luang Prabong and of Nan, and the parts intended to be opened up by the projected railway from Bangkok to Korat. I may here mention that a valuable communication has just been received from Mr. H. Warington Smyth, describing his voyage up the Menam and

his journeys in the mountainous country to the west of the Mekong. Our young correspondent is a son of our former colleague, the late Sir Warington Smyth, and a grandson of our President Admiral Smyth, to whom the Society owes so much, and who was one of our seven founders. Mr. Warington Smyth's narrative is of geographical value and is charmingly written, and it is pleasant to find that in this instance the geographical mantle of my distinguished predecessor has so worthily descended on his grandson. In the Malay Peninsula there is also much to be done; and Mr. Lake has just brought home some good surveying work of previously unexplored country in the territory of Johore. But we have to deplore the death of Mr. Becher, who unfortunately lost his life in a river in the southern part of the Malay Peninsula just after he had entered upon what promised to be a useful piece of geographical work.

Passing over the great Empire of China, which has been traversed in numerous directions, and the geography of which is tolerably well understood, we come to Korea. In this peninsula, which until lately had scarcely been visited, the pack roads between the principal towns are now pretty well known, but there remain a number of routes on the western side, from Söul down to the south coast, and on the east side between Gensan and Fusan, which Mr. Curzon informs me have either not been traversed in modern times or are wholly unexplored. There is very great need of a survey and map of Korea, and, apart from the pack roads, the mountainous parts of the country are quite unknown. There is thus very considerable scope for geographical enterprise in this great peninsula, which may be looked upon as one of the numerous allurements which the unknown parts of the world present to the explorer.

Leaving the great Asiatic continent, and turning our attention to the mass of islands to the south, and stretching away eastward to the Pacific, we shall find that the most important future work will have to be done by the hydrographer rather than by the geographer. Doubtless there are many unreported reefs and shoals, and others whose recorded positions require verification. Yet when we think of the splendid work of Mr. Wallace in the Malay Archipelago, and of the lonely residence of Mr. Forbes on Timor Laut, there can be no doubt that much is also left for the explorer to do on land among those lovely islands. Sir William Macgregor will steadily proceed with the examination of British New Guinea, and will encourage all well-conceived schemes of discovery. Mr. Woodford tells me that, in his opinion, a properly equipped expedition would have little difficulty in passing from the head-waters of the Fly to those of the Empress Augusta River, and so crossing New Guinea in its broadest part. Meanwhile the interior of Dutch New Guinea is a complete blank—another of the vast tracts which await discovery. Here there is an extensive range marked on the maps as the Charles Louis Mountains, and attaining a height of 16,000 feet. The particular exploration of this range would

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offer work for geographers and naturalists for many years to come. Another interesting piece of work for a young explorer to undertake would be a definite solution of the question whether a passage exists right through the supposed isthmus from Maclure Gulf to Geelvink Bay, as has been reported. More knowledge of the islands to the north of New Guinea is also needed, where the natives present the chief obstacle to exploration. In the Solomon Islands, Mr. Woodford was successful in visiting the interior of Guadalcanal, but Bougainville Island is still absolutely virgin ground, and I am informed by Mr. Woodford that there is a most interesting elevated coral lagoon to the north of the island of New Georgia which has hitherto been undescribed; while Rennell and Bellona Islands, to the south of the Solomon group, are said to be elevated about 400 feet above the sea, yet exclusively of coral formation. The natives are Polynesian, not of Melanesian race, and they would certainly well repay a visit. The whole question of the mingling of Polynesian and Melanesian types on these groups of islands calls for careful investigation, as well as further study of the formation of coral reefs. Mr. Woodford suggests that it would be desirable, if funds could be obtained for the purpose, to make an experimental bore with a diamond drill upon some island of purely coral formation, situated in very deep water, and as far removed as possible from any high land. He thinks one of the islands of the Gilbert or Ellice groups would be suitable for the experiment.

It is unlikely that there are now any undiscovered islands in the Pacific, although I well remember the time when we fully expected that there might be, and when we were ordered to enter in the deck log, during our watches, the visibility of distant objects. Thus our tracks formed belts varying from 10 to 15 miles wide, within which no new islands were to be found.

Australia has now been explored in its whole extent. The work was watched with the deepest interest and sympathy by our Society; and no less than twelve Australian explorers have received our gold medal. Queensland, New South Wales, Victoria, and South Australia proper are thoroughly well known; but in Western Australia there are still large isolated tracts of the country in the interior which are unexplored. The most important lies east of the 120th meridian and between about 21° and 24° south. Mr. Ernest Favenc points out that the important geographical fact to be determined by an examination of this tract would be the settlement of the question whether Sturt's Creek again reformed, after having been for a time lost. Probably some patches of pastoral country and some unconnected water-channels and saline swamps would also be found. Mr. Favenc considers that the geographical problem to be worked out in Australia, during the ensuing years, is the evolution of a last river system, which will fill up the gap between the heads of the west coast rivers and the Lake Eyre

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system. It is not likely that such a system will exist in anything more than a fragmentary form, but certain fixed drainage rules peculiar to that region may be found to exist which would dispel the present notion that the creeks there run at random to all points of the compass. The northern coast regions are now well known and fairly well settled throughout by sheep-farmers; and the gold discoveries in the south-west of the continent are extending inland and may reach the unexplored space, as belts of auriferous country are known to exist across the interior.

In New Zealand, as Mr. Douglas Freshfield has recently pointed out, a glorious field is open for the mountaineer, for the so-called Southern Alps have the glaciers of the Alps, the forests of the Caucasus, and the fjords and waterfalls of Norway all brought into close juxtaposition. Stirred by the success of Mr. Green's ascent of Mount Cook, the young New Zealanders have formed an Alpine club under the presidency of Mr. Harper. The proper line of exploration would be to continue establishing huts on both sides of the range, so that the relation and divergences between the west and east flanks may be fully investigated. Hitherto the east side has been principally explored.

Australia now has Geographical Societies of her own, active and learned bodies which are doing good work. It has been suggested by Baron Sir Ferd. von Mueller, and his idea has been adopted by his colleagues in Australia, that, with the object of establishing close affiliation between the parent Society and all the branches, our Council might annually elaborate a series of questions for transmission to our colonial and provincial colleagues. Such questions might refer to tidal observations, oceanic currents, the most important spots for additional hypsometrical data, accurate determination of longitudes, and the settlement of new projects for exploration. I am quite of opinion that this suggestion is well worthy of the consideration of our Council.

The New World, including the two continents of North and South America, has been in process of discovery for the last four centuries. The nearer parts had to be settled before the more distant parts could be explored. The whole of the coasts, indeed, have been surveyed with more or less completeness, and the United States Coast Survey is a monument of rigorous accuracy. But much of the interior is still unknown or very partially explored. This is certainly the case in the Dominion of Canada; and Dr. George M. Dawson recently said that we are far from having acquired even a good general knowledge of fertile lands with a rigorous climate which will only yield hardy crops, although comparatively little of the region capable of producing wheat is now altogether unknown. Then there are vast tracts of unknown country where possible mineral wealth would be the only material incentive for their exploration.

Within the Arctic Circle there is an unknown area covering 9500

square miles, between the eastern boundary of Alaska, the Porcupine River and the northern coast. Another area of 32,000 square miles of considerable interest, and probably containing the head-waters of the White and Tanana Rivers, lies west of the Lewes and Yukon, and extends to the Alaska frontier. There is an unknown tract of 27,000 square miles between the Lewes, Pelly, and Stikine Rivers, which lies on the direct line of the metalliferous belt of the Cordillera. Between the Pelly and Mackenzie Rivers there are 100,000 unknown square miles, including nearly 600 miles in length of the main range of the Rocky Mountains. Our Back Grant testimonialist, the Abbé Petitot, has made a short journey into the northern part of this area from the Mackenzie River, but otherwise no published information exists respecting it. Another Arctic area, between the Great Bear Lake and the northern coast, covering 50,000 square miles, is also unknown; and yet another of 35,000 square miles south of the Great Bear Lake, except for the journeys of the Abbé Petitot and Mr. Macfarlane. Further south there is an unknown tract of 81,000 square miles, between the Stikine and Liard Rivers to the north, and the Skeena and Peace Rivers to the south, and another of 7500 square miles between the Peace, Athabasca, and Loon Rivers. An unexplored area south of the Athabasca Lake is 35,000 square miles in extent.

Turning again to the Arctic Regions there is an area of 7500 square miles east of the Coppermine and west of Bathurst inlet, and another of 31,000 square miles between the Back River and the Arctic coast. I quote Dr. Dawson's figures, but I do not forget the work that has been done by Mr. Warburton Pike from the love of adventure, sometimes living on cariboo, at others on musk oxen, at others on cachés formed when game was abundant, and at others suffering from starvation. With no companions, save a few Indians, he has crossed and recrossed the barren lands of America. We next come to the vast unknown tract of 178,000 square miles between the Back River and the west coast of Hudson's Bay, part of which was wandered over but not mapped or explored by Hearne in 1769-72, and I believe it has also been traversed by Mr. Pike. There are smaller unknown areas to the south of Hudson's Bay, while the whole interior of Labrador, covering 289,000 square miles, is entirely unknown beyond the short routes of Professor Hind, Mr. Low and Mr. Holme, and Père Lacasse. This tract is believed to be more or less wooded, and in some parts with timber of large growth; but the practical utility of its future exploration will probably be derived from its metalliferous ores. Dr. Dawson sums up his enumeration of unknown areas with the calculation that out of the 3,470,287 square miles which form the area of the Dominion of Canada, 954,000 square miles at the very least are entirely unknown. In looking forward to the future examination of these areas, Dr. Dawson remarks that the explorers should be possessed of scientific training and be able to make intelligent

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and accurate observations. The work of Mr. Green and of Mr. Topham in the Selkirk Range of British Columbia has been excellent, and it has brought to our notice a region of the greatest orographic and geological interest, part of which is still unmapped and unvisited.

In the United States there is much that remains to be done in Alaska, although the labours of Mr. Fred. Whymper, Seton-Karr, Topham, Nelson, and Ogilvie have thrown light on the alpine regions with their extensive glaciers, which culminate at Mount St. Elias and on the basin of the Yukon. In the vast territory of the Union itself surveying work of a more exact and rigorous character is making progress, and the admirable coast survey from the Bay of Fundy to the mouth of the Rio Grande on the east side, and from the Strait of Juan de Fuca to San Diego on the Pacific side is completed. Its merits were cordially recognised by this Society when our gold medal was conferred upon Professor Bache in 1858. Inland topography, however, owes most to the geologists, for Powell in the Rocky Mountains region, Hayden in the territories, and Clarence King on the 40th parallel have been obliged to make their maps as they proceeded with their geological investigations. The triangulation in the interior of the States was commenced late and its progress has been slow.

There is a great deal of work for an explorer in Central America, where our associate, Mr. Maudslay, has done so much excellent service, and where we are also indebted to the researches of officers from British Honduras. But it is in South America that the most extensive unexplored regions are still awaiting the visits of scientific travellers. Many parts of the Columbian Andes need exploration as well as the basins of the great rivers Japura and Putumayo, and some of the smaller affluents of the Amazon, such as the Pastaza, Morona, Santiago, Napo and Tigre. There is an enormous tract in Colombia bounded by the slopes of the Andes on the west, by the Orinoco and Rio Negro on the east, on the north by the Meta, and on the south by the Uaupes and Japura, which is practically unknown. I have called attention to this region on previous occasions in the hope that some one would undertake its exploration. For it was here that the old conquerors of the 16th century, without watch or compass, sought for El Dorado. Another unknown region lies between Guiana and the Amazon, while the rivers Jurus, Jutay, and Tefè are unexplored. The admirable survey of the great River Purus and its main tributary secured for Mr. Chandless the gold medal of our Society; but many of the affluents of the Beni, flowing from the Andes of Cuzco, still require scientific exploration.

The mighty Cordilleras of the Andes have only been very partially examined. From Mr. Whymper's delightful book, with its superb illustrations, we learnt much about the famous peaks of Ecuador, and some of our ideas received correction; while the surveying labours of

Mr. Wolf, in the same region, have led to the examination of the little known provinces between the Andes and the Pacific and to the production of a most valuable map of Ecuador. In Peru the learned President of the Lima Geographical Society, our honorary associate, Dr. Luis Carranza, has admirably described the geography of some of the provinces of the Andes. Still there is an undescribed Andean region, comprised in the provinces of Lucanas, Parinacochas, Cangallo, Aymaraes, and Cotabamba; and in the coast valleys and deserts between Nasca and Lajes. Forbes, Minchin and Wiener have ascended Illimani and Illampu, but the mountains of the coast-range further south are almost unknown, and the great peaks of Sajama and Pallahuari are still unmeasured.

Indeed, the whole orography of western South America is very imperfectly understood, and would well repay further scientific examination. The great rivers of the Gran Chacu, flowing from the Bolivian Andes to the Paraguay, are still incompletely explored, especially the more northern streams. Captain Page read a most interesting paper on the subject at our meeting on January 28th, 1889. In the discussion which followed I mentioned that the Gran Chacu was one of those regions to which geographers might point, when they were tauntingly asked what was left for them to discover. Captain Page has since lost his life—a martyr to science and to duty. His work will be taken up by others where he has left it. The exploration of these streams, especially of the Utuquis, and the region through which they pass, must needs be completed. For some day they will form great fluvial highways of commerce. Further south there are tracts needing examination, especially along both sides of the dividing line between Chile and the Argentine Republic, as well as in Patagonia. The government of Neuquen is one of these, a region with mountain slopes covered with beech (*Fagus Antarctica*) and pine (*Araucaria Brasiliensis*) forests, and with active volcanoes along its summits; while its rocks abound in fossil shells and wood, and send forth thermal springs. The belief that in this district, the Collon-cuá (called in its upper part the Mumini) flowing to the Atlantic, has its source in the same lake as the Bio Bio, flowing to the Pacific, would be an interesting point for an explorer to clear up. I rejoice to find, from an interesting memorandum furnished me by Captain Don Benjamin Garcia Aparicio, of the Argentine Corps of Engineers, that exploration is being zealously promoted and encouraged by our sister Geographical Society at Buenos Ayres.

We have now made a general survey of the unexplored and undiscovered *lands* of our globe. But the work of geographers is by no means confined to the land.

It is nearly forty years since Maury published the first edition of his 'Physical Geography of the Sea.' He was the founder of a new, and most interesting branch of our science, which treats of the ocean depths, of the currents and temperatures of the sea, of its biology, and

of the surface of the ocean bottoms. In 1855 this was a new field of research; when the *Arctic* and the *Cyclops* were running their first lines of soundings across the North Atlantic; and when Brooke and Wallich were inventing the first apparatus for bringing up samples from great depths. Since then, through the labours of scientific officers of several nationalities, the gates of this new field have been opened wider and wider. The result is due to the invention of improved appliances and to the persevering work of deep-sea soundings and dredgings as well in narrow seas as in the great oceans. This, of course, is not work for individual explorers, but rather for the governments of maritime nations. Yet I would urge upon the attention of naval officers, of officers of the naval reserve, and of the mercantile marine, that they all have frequent opportunities of adding to our knowledge, and of doing useful work in forwarding the examination of the depths of the sea, and in contributing to our knowledge of meteorology.

An immense mass of work remains to be done to enable us to have even a rough and general knowledge of the ocean depths. Additional lines of soundings are needed in all directions, especially in the southern ocean and in the Central Pacific, to bring out their general configuration. We now have a rough idea of the areas of greatest depths, the greatest of all having been obtained off the coast of Japan by the *Tuscarora* in 4655 fathoms; but the soundings of the *Challenger* between St. Thomas and Bermuda, and of the *Egeria* in the Pacific come very near to it. The discovery of the very greatest ocean depth will be most interesting, but it would be still more so to discover and map the submarine ranges and peaks to within, say, 500 fathoms of the surface. I remember that when the *Valorous* ran a line of soundings across the North Atlantic in August 1875, we got 1860 fathoms on one day, 1450 on the next, and only 690 on the next, bringing up pieces of black volcanic stone. On the two following days the depth increased to 1250 and 1485 fathoms. Here there was clearly either a volcanic peak or a ridge; and wherever these are known to occur I think that it would be very desirable to explore the surrounding ocean bed, and ascertain their extent and character. We want also the establishment of a more complete study of the system of ocean currents, by a very extensive use of floats adapted to swim at various depths; and also a fuller investigation of the temperature and density of the water surrounding the shores of all the continents. The work hitherto done in the North Sea and the neighbouring Atlantic is practically confined to the summer months, and a detailed examination at all seasons is needed. Such work is now being done under the auspices of Professors Petterssen of Sweden and Mohn of Christiania, Krümmel of Kiel, and the Fishery Board of Scotland. We also require a determination of the isotherms and isobars on land and sea at all seasons, which will primarily involve prolonged observations in the south-polar region, and a more complete knowledge of the

variation of atmospheric pressure with height, and its independent variation in different horizontal planes. Such an investigation embraces the whole question of the use of the barometer or boiling-point thermometer in measuring heights.

This will conclude my enumeration of the geographical desiderata in the field. It is a long and formidable list, affording work for many decades of years to come. But many of my associates know very well, and the rest must now clearly understand, that it is by no means an exhaustive list; but only such an enumeration as our limited time will admit of our making, merely a rough general survey of the work in the field that remains to be done.

The work of explorers is co-ordinated and rendered useful in many ways by geographical students, whose valuable labours desire equal attention and encouragement. There are many geographical problems which must be solved as well by the examination and inter-comparison of the work of numerous explorers in different regions, as by the careful study and application of the achievements of the devotees of our science in past centuries. The advance and extension of geography depends as much upon its students and scholars as upon its discoverers and explorers. Comparative geography is indeed one of the highest branches of our science. By identifying sites, comparing descriptions written long ago with the actual surface of the ground, and by demonstrating the changes which have taken place within historical times, it is an indispensable auxiliary to physical geography. We shall, I am sure, all be glad to receive the results of the investigations of our Oxford Travelling Scholar, Mr. Grundy, who has compared the narrative of Herodotus with the actual ground where the battle of Plataea was fought. Comparative geography also enables us to comprehend the gradual evolution of our science, through the discoveries and life-long studies of a long series of devoted men during a succession of ages. Such knowledge is of the deepest interest. We, therefore, welcomed in 1891 Dr. Schlichter's ably reasoned paper on Ptolemy's topography of eastern Equatorial Africa; and we shall be glad to receive further results of his researches. Mr. Ryland's long and careful bibliographical and mathematical study of Ptolemy, and his laborious corrections and verifications, have also resulted in an important addition to Ptolemaic literature.

The spirit in which geographical students enter upon their researches, and the methods they adopt, have a special interest at a time when the educational efforts of the Society justify the expectation that their numbers will soon increase. Dr. H. S. Schlichter, who has already communicated the most interesting paper on Ptolemy's geography of Africa—to which I have just alluded—has explained to me his system of investigation. He not only uses history for the solution of physical phenomena, but also resorts to physical facts and observations for solving questions of historical geography. By looking at the problem

under consideration in all its bearings, and the various ways which seem to lead to its solution, an insight is obtained into the nature of the questions we have to deal with, and into the trustworthiness of the sources of our information. Such studies lead from one problem to another, they open up new questions and lines of research, and not only connect physical and historical facts of all times and ages, but also join our own minds and thoughts with those of men who lived and worked centuries before us. Hardly any branch of science is of greater interest in this respect than comparative geography, because wherever we turn we discover links which connect the development of our race with the changes on the surface of our planet.

Dr. Schlichter is now engaged in studying the desiccation of parts of Africa, and he has, with great labour and research, drawn a series of sections across that continent. The subjects—in physical geography—which offer themselves for the investigation of the student are, indeed, as numerous as they are fascinating. The processes of denudation, of erosion, and of transportation may be studied and compared; while—as Professor Lapworth has pointed out—the agencies which rule in the processes of upheaval and depression are still almost entirely unknown to us. The Professor's address, delivered at Edinburgh last year, on the crests and troughs which succeed each other on the Earth's surface in endless sequence, of every gradation of size, of every degree of complexity, offers much matter for reflection to the student of geography. The geological fold—as described in Professor Lapworth's address—should receive the attention of physical geographers who can take advantage of their great opportunities as explorers and as students, by investigating as well the simple fold, often under altered conditions caused by erosion, as the tangential pressures and other influences that have been at work on it. Thus we should combine with geologists in working out nature's problems, while we study the Earth's past history in order to understand its present condition; for although the limits between the sciences of geography and geology have been clearly defined, the difference between our studies consists rather in our methods and objects than in the materials on which we work. We are, therefore, prepared to give a cordial welcome to Mr. Oldham's promised paper on the present condition of the surface of British India, as explained by its former geological history.

If a competent acquaintance with geology is required for an accomplished geographical explorer, a knowledge of biology is equally desirable. For instance, the study of the fauna of inland lakes and rivers has been pointed out, by Darwin and Peschel, as important in connection with many problems in physical geography. It is two thousand years ago since Eratosthenes, who presided over geographical science at Alexandria, drew scientific conclusions from the fact that certain shells were found near the oasis of Jupiter Ammon. It was by the study of the fauna of

large lakes in North America and in Asia that their marine origin was established; while we deduce the former existence of lands now submerged, from the comparison of fossil animals. Plants have acted an equally important part, both in effecting the condition of the Earth's surface, and in revealing to us its former history.

I anticipate that such investigations will occupy some of our present and future students and explorers as they have occupied their predecessors; but they will I trust always bear in mind that the basis of all geographical work, if it is to be really valuable, is the fixing of positions astronomically. Accuracy and reliability can alone make their work permanently useful. Much attention ought, therefore, to be given to the handling and adjustment of instruments, and to their improvement. Experience in the field often leads to suggestions which bear fruit when they are carefully thought out. Thus there have been several forms of range-finders invented in recent years, which might be used in making rough surveys. Both Sir George Airy and Mr. Merrifield have introduced new methods of computing lunars, and a method of semi-azimuths, invented by a yachtsman, is now under discussion. Dr. Schlichter has recommended the use of an apparatus for photographing moon and stars for lunars, which is described 'in the November Number of our *Journal*, and Colonel Stewart invented another apparatus for surveying by photography. Improvements are sure to suggest themselves to intelligent workers. Major Watkin has improved on the aneroid. Several attempts have been made to improve the artificial horizon. Major Verner has invented a compass to be used for travelling at night.

Photography now occupies an important place in relation to geography, and a photographic camera should form part of the equipment of all explorers engaged in original geographical work. It is to be regretted that travellers have not taken more advantage of the facilities afforded by the Society, as the use of an instrument should be thoroughly mastered before a traveller proceeds on a journey. In photometry it is necessary that objects represented on the plate should be clear and well-defined, to facilitate the taking of measurements from them; and this has now become specially important since the invention of the new method of taking lunars.

It is in the direction of the improvement of instruments, cameras, and other appliances used by the traveller, and of methods of observing and computing, that experienced and ingenious men should continue to turn their inventive faculties. Very often an improvement occurs to an observer while using an instrument in the field, which afterwards, by following up the train of thought, leads to the perfection of a practically useful invention. This has been the case from the days of Martin Behaim to those of Leigh Smith.

Many of the rising generation of geographers, whose talents lie in

that direction, will also, it is to be hoped, master the beautiful and most useful art of the cartographer, including the work of the compiler and of the draughtsman. At present there are none too many in this country. When we reflect on the exquisite specimens of Italian and Catalan *portolani* which are preserved in the British Museum, and on the great geographical interest attaching to early examples of cartography, it is impossible not to regret that we are unable to produce an atlas such as the Berlin Geographical Society brought out last year. There are as yet no adequate opportunities, in this country, for developing the latent powers of the potential Kretschmers who doubtless exist among our young English geographers, but I trust that every encouragement will be given to those who, in the future, give their attention to this branch of our work.

Turning once more to the qualifications of an explorer, Mr. Galton has suggested to me that the art of geographical description is a very needful one. It is seldom that a country resembles what the visitor has been led to expect from reading recent descriptions of it. It is not the so called "word painting," now so elaborately employed, that conveys the most correct picture; but rather pithy epithets and sharp clear touches. The old writers were often excellent in doing this, with their forcible homely language; and they should be read until some echo of their pure vigorous style has been caught. The necessity for cultivating the describing faculty, and for studying the general principles underlying all good description should be inculcated by those who train men as geographical explorers; for a traveller is of no use if, when he comes back, he fails to convey to others a correct idea of what he has seen.

The various subjects to which a geographical student or explorer can give his attention are as fascinating as they are numerous; and whether he devotes his talents to the improvement of instruments, or to the work of the draughtsman and map-maker, or to the manifold phases of physical geography, or to discovery in distant lands, or to the elucidation and illustration of the history and progress of our science, he will alike be furthering, and advancing our objects, and will have a right to claim our assistance and our sympathy.

We do not invite geographers to enter upon any of these difficult undertakings without being prepared to supply them with a suitable training, and to give them all the sympathy and encouragement in our power. This was not always the case. I well remember that a young officer in command of the Hausa police force came to me for advice, just twenty years ago. He wanted to learn the use of the sextant and artificial horizon. At first I had no answer to give him. But afterwards I found out that a widow lady, named Janet Taylor, gave the required instruction in the Minorities to mates of merchant ships. It was this dearth of the means of learning the work of an explorer that

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forced my attention on the duty of finding a remedy. Mrs. Taylor was an efficient teacher, I believe, but the Minorities are far off, and her single efforts could not supply what was needed. It was then that I submitted proposals, that the Society should appoint an instructor and furnish the necessary facilities for enabling explorers to learn their work. Our Council saw the importance of supplying a great need, and Mr. Coles was appointed to instruct intending travellers in practical astronomy and surveying. My proposal included instruction in geology and biology, and now arrangements are made for teaching what an explorer would need in these branches of knowledge also, as well as in photography. I look upon this as the most successful measure that has been adopted by this Society in recent years, and the one which has done most to advance the interests of geography. Since Mr. Coles began to give instruction in surveying and nautical astronomy, he has taught two hundred and thirty-nine pupils, including officers in the army and navy, in the consular and colonial services, missionaries, civil engineers, and private travellers. These instructed explorers have done valuable geographical work in all parts of the world: in Africa, Asia, North and South America, the Malay Archipelago and Pacific Islands, and in the Arctic Regions. Of the two hundred and thirty-nine pupils, twenty have studied photography, eighteen botany and forty geology, in addition to surveying and nautical astronomy. It is of the utmost importance that explorers should be thoroughly trained for their work, and their instruction is consequently one of the most indispensable duties of our society.

In this imperfect survey of our geographical *desiderata* I have endeavoured to draw the attention of my associates, not only to the extent of unknown country to be discovered and explored, and to the numerous problems and questions of interest which await solution, but also to the duty that is laid upon us, each one of us—to take his share of the task, some by useful advice and co-operation, some by encouragement, all by a hearty determination to work together for one great end—the usefulness and prosperity of our Society.

Admiral Sir LEOPOLD McCLESTOCK : It is most gratifying to me to be permitted to propose the resolution which I think follows the reading of the address. I have had the pleasure of knowing the President for a very long time; more than forty years ago we served together in the same ship throughout an Arctic winter. During the long interval since that time, he has devoted almost the whole of his conspicuous talents and his amazing industry to the advancement of geographical knowledge. He has himself taken part in exploration of no ordinary degree of hardship. He has travelled in many unfrequented lands and under many difficulties, and as a geographical student, he has made many researches, and has brought to light many interesting and valuable facts. I think it is to the last of these efforts that we are indebted for a biography of Christopher Columbus, the greatest of all geographical discoverers; it is a most interesting and delightful narrative, one of the most delightful in our language. We, the Fellows of this Society, know well how long and how

faithfully he has laboured at the council board to promote the increase of geographical exploration and research, to diffuse geographical information, and to make more generally known and felt the practical utility of geographical science. The address to which we have just listened is so instructive, so interesting, that it testifies to a very long course of special study. I am quite incompetent to speak of its varied merits, but I will venture to say here, that from what we know of Clements Markham in the past, we, the Fellows, are all of one mind, that he is eminently qualified to direct the labours and guide the future of this great Society on its distinguished course of invaluable work. And here in passing I beg leave to allude to the very honourable mention of our President in to-day's *Times* newspaper; it recognises in him the originator of the chinchona plantations in India, a work of extreme value. I beg therefore to propose that our best thanks be given to the President for his very able and instructive address, and to express a hope that he will allow it to be printed and circulated among the Fellows of the Society.

Capt. LOVETT CAMERON: Allow me to second that motion heartily. When I started for my journey across Africa, the most hearty supporter I had was the present President of the Geographical Society. During all the difficulties I had on my journey, I rested my heart on what he did for me, and I have never found any more loyal friend in this world than the present President of the Royal Geographical Society. I had difficulties and troubles in crossing Africa. I did my work, as I said after I came back, honestly, and I believe it; but I should never have got across Africa if it had not been for the way in which he fought my battle when I was away. We have all listened with the greatest possible interest to his address, and I congratulate the Society on now having as a President a scientific geographer, neither looking to the right hand nor to the left hand, but to the interest of the Society. I wish to render to you to-night, Mr. President, my most sincere thanks for all you have done for me, and on behalf of the whole of the Society for what you have done for us.

The PRESIDENT: I have to thank Sir Leopold McClintock and Capt. Cameron for the kind words they have spoken of me, and the meeting for the way they have received them. I have to announce that at our next meeting we shall have a most interesting paper on the results to be derived from Antarctic explorations, by Dr. Murray of the *Challenger*.

GEOGRAPHICAL RESULTS OF THE ANGLO-PORTUGUESE DELIMITATION COMMISSION IN SOUTH-EAST AFRICA, 1892.*

By Major J. J. LEVERSON, R.E.

THE country surveyed by the Anglo-Portuguese Delimitation Commission in 1892 consists of a narrow strip of territory extending south for about 140 miles from the sources of the Gaeresi River (Zambesi Basin), situated in about lat. 18° S., and then S.S.W. to a point described in Article II. of the Anglo-Portuguese Convention of June 11th, 1891, as the north-eastern point of the frontier of the South African Republic. This point is situated at the junction of the Rivers Limpopo and Unvubu in latitude about 22° 25' 32" S.

* Map, p. 576.

With the exception of the bush-covered plateau between the Rivers Sabi and Limpopo, the country is generally very mountainous, and is traversed by innumerable streams of excellent water, belonging to the basins of the Zambesi, the Pungwe, the Busi, the Sabi, and the Limpopo, all of which flow into the Mozambique Channel.

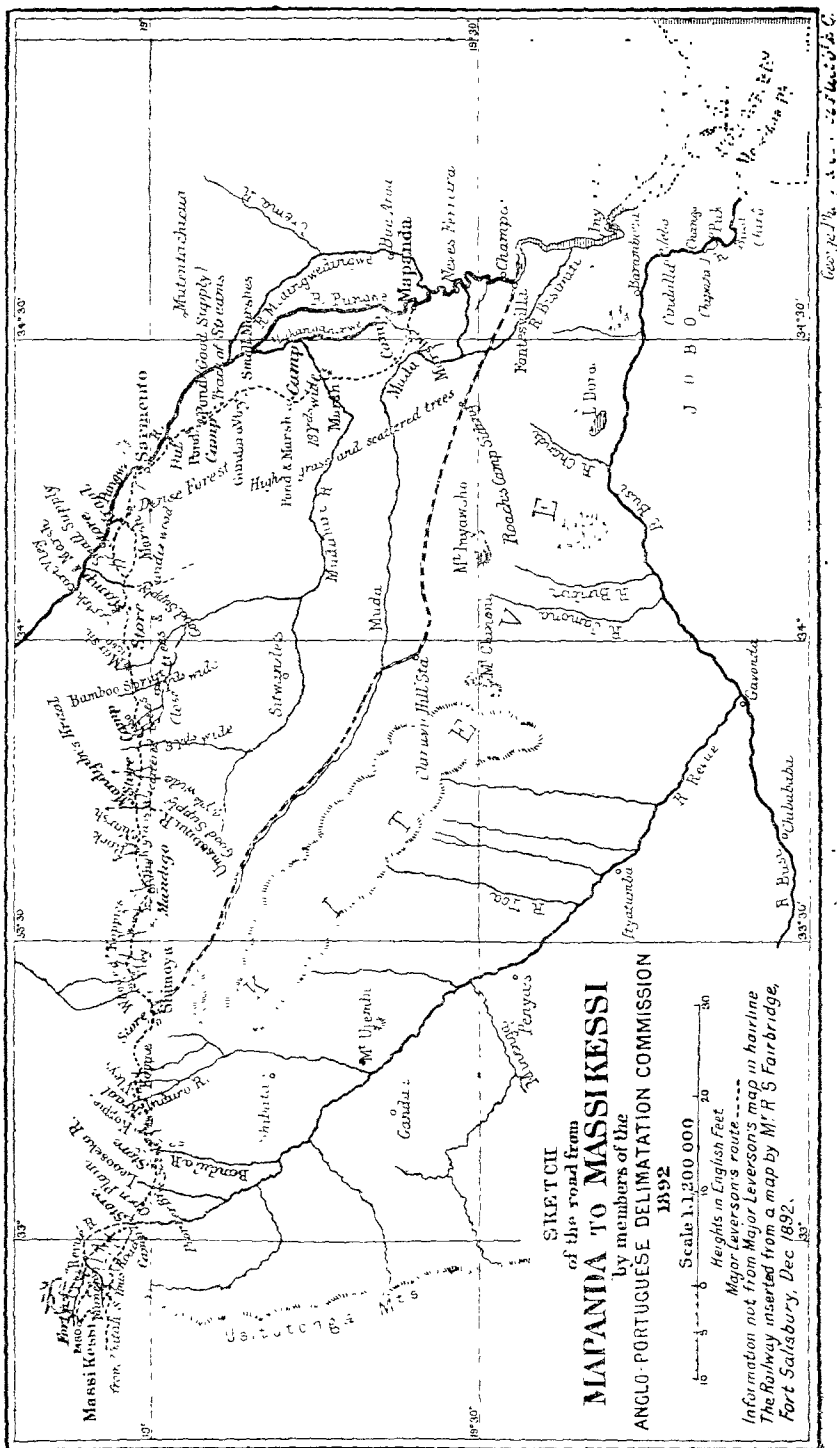
The basin of the Pungwe is bounded on the north by the watershed separating it from the Zambesi basin, on the south by that separating it from the Busi basin, and on the west by the Sabi basin. The main stream of the Pungwe rises in the Inhangani Mountains, many of the peaks of which are between 6000 and 7000 feet high, and runs generally in a south-easterly direction to the sea. Within the limits of the survey it may be described as a rapid mountain river, but east of long. 33° E. it enters a flat country covered with thick forest, the monotony of which is relieved here and there by small isolated mountains and koppies with steep slopes which stand out abruptly from the plain.

At a ford almost due north of Mount Zaramira, where the Commission crossed the river at the end of October, the water was about 3 feet deep, with a strong current and stony bottom. The general width where not cut up by islands was from 30 to 40 yards. There were numerous deep pools in which hippopotami were plentiful. After rain the Pungwe rises very rapidly, and a portion of the Commission when returning from the north to Massi-Kessi in the middle of November, was delayed twenty-four hours on its northern bank, and only succeeded in crossing eventually with great difficulty.

At Sarmento in May it varied from 100 to 200 yards across, and was flowing in a broad sandy bed. In March and April vessels drawing 3 to 4 feet of water can ascend as far as this, but during the dry season of the year navigation ceases above Mapanda's for all boats except native canoes.

Between Sarmento and the sea the river winds its way through an almost dead-level alluvial plain, gradually increasing in width, and in its lower reaches resembling rather an estuary of the sea than a river. Near the sea the banks are very swampy and overgrown with white mangrove. After the rains a large portion of the alluvial plain is inundated, usually to a depth of $1\frac{1}{2}$ to 2 feet. The tide rushes up as far as Mapanda's in a tidal wave or bore. Navigation is very difficult owing to the numerous and constantly-shifting sand-banks. Below Mapanda's few hippopotami are to be seen, but the river is infested by crocodiles in great numbers. Large game is plentiful along the banks.

West of long. 33° E. the left bank tributaries of the Pungwe are mere mountain torrents; on the right bank the most important tributary is the Honde, which rises in the mountains not very far from Umtasa's kraal, and flows through a densely-wooded valley. Some miles above its junction with the Pungwe it is joined by the Inyamkarara. Both the Honde and the Inyamkarara contain many deep pools, but are



fordable in places. We crossed both rivers due south of Mount Zaramira on October 27th. My notes regarding the fords are as follows:—*Inyankarara*: Strong current, stony bottom, 2 feet deep, 20 yards broad. *Honde*: $2\frac{1}{2}$ feet deep, 25 yards broad, slight current, sandy bottom.

On the march from Mapanda's to Massi-Kessi the most important tributaries of the Pungwe met with are the Muda, which, under the name of Bigamiti, flows into it some distance below the railway terminus at Fontesvilla, and the Mudichiri, which flows into it between Mapanda's and Sarmento. In May the Mudichiri at the drift by which we crossed was about 2 feet deep and 30 yards broad, with a one-knot current. In November the volume of water had diminished very considerably.

The portion of the Busi basin included within the operations of the Delimitation Commission extends from about lat. $18^{\circ} 50'$ S. to lat. 21° S. The most important north bank tributaries are the Revue and the Lusitu Rivers, and on the south the Umswilizi River. The Busi proper rises in the table-land north of Mapungane's kraals, and flows generally in a south-easterly direction to its junction with the Umswilizi, after which it makes a sharp bend to the north-east. Where crossed by the Delimitation Commission it had not assumed any large proportions. In August at a drift a little above its junction with the Nyamahumba it was only $2\frac{1}{2}$ feet deep and 15 yards broad.

The Revue rises in the mountains between Massi-Kessi and Umtasa's kraal, and flows eastward past the old fort of Massi-Kessi, which has now been converted into the Mozambique Company's headquarter offices in Manica. The new township of Andrade is situated on the Zambusi, a small tributary of the Revue. The Selous waggon-road from Shimoya's to Umtali runs up the valley of the Menini, another tributary of the Revue. At the drift where this road crosses the Revue about 14 miles below Massi-Kessi, the stream was in May last about 2 feet deep and 40 yards broad, with a rapid current. In November the water had diminished very much, and was only about 30 yards broad and $1\frac{1}{2}$ feet deep. During the rains the river becomes impassable, and crocodiles are said to be numerous.

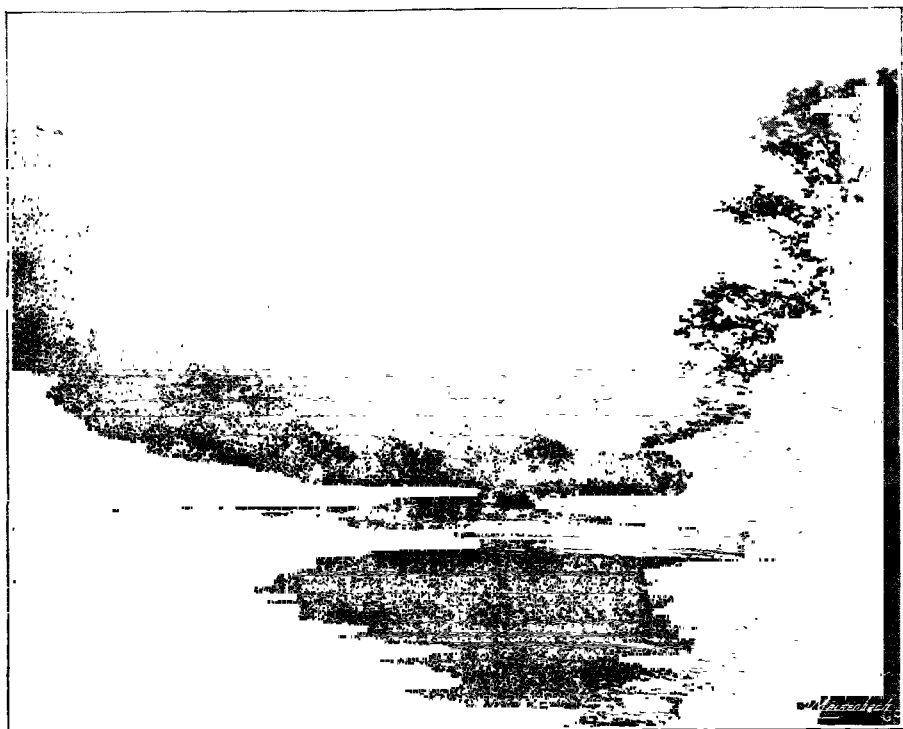
The streams rising in the Udza Mountains between Mount Vumba and the Chimanimani Pass flow generally eastwards, and find their way eventually into the Revue.

Just north of the Chimanimani Mountains the Great Musapa River flows through a narrow, rocky gorge, enclosed on both sides by towering cliffs. On most maps this river is shown as a tributary of the Lusitu, but whether this is correct, or whether it joins the Revue, or flows direct into the Busi, we had no opportunity of ascertaining.

The Lusitu River, within the limits of our work, was an important stream flowing in a deep valley, the mountains on its northern or left bank rising steeply to a height of several thousand feet above it. On

the right bank the country was less mountainous and was covered with luxuriant tropical vegetation, in which clearances had been made here and there for the cultivation of mealies and other kinds of grain. Fish were plentiful in the river. The stream varied from about 25 to 40 yards in breadth, and at the ford where we crossed in July was about 3 feet deep.

The Harom River, a fierce mountain torrent which runs southwards along the foot of the craggy and precipitous western ridge of the Chimanimani Range, flows into the Lusitu some miles below the ford.



VIEW OF THE LUSITU RIVER.

We succeeded in exploring the greater portion of the Umswilizi, and ascertained that the somewhat remarkable circular course of this river shown on most maps hitherto published in dotted lines is pretty nearly correct. At the drift near Mahash's kraal the stream was in August about 20 yards broad and $2\frac{1}{2}$ feet deep. From this point to its junction with the Busi it flows through a slightly undulating country, shut in on the north by the low mountains which separate it from the Sheneyka, but to the south the country is open as far as the eye can reach.

Nearly the whole of the upper course of the Umswilizi is through

a mountain gorge, from which it emerges a little above the above-mentioned drift. This gorge is in some places narrow, while in others it widens out considerably, and affords room for native villages and fields of mealies, Kaffir corn, etc., along the river-banks. The slopes of the mountains enclosing the gorge are for the most part covered with thick forest. The river itself consists generally of a series of long, almost still reaches connected by rapids. The scenery within the gorge is everywhere very beautiful.

South of the Umswilizi the character of the country soon changes; it becomes much less mountainous, drier, and more sandy. The Mlongezi is a small sluggish stream flowing into the Umswilizi. Its valley constitutes the southernmost portion of the Busi basin. Beyond this a gently undulating district covered with grass and stunted trees forms the watershed between the basins of the Busi and the Sabi.

At the point where we struck the Sabi, about 4 miles above its junction with the Lundi, it had just emerged from a mountain gorge and entered the great plain through which it finds its way to the sea. It was flowing in a broad sandy bed from $\frac{1}{4}$ to $\frac{3}{4}$ mile broad, the actual width of the stream, however, in August and September being only from 50 to 100 yards. The water was about $2\frac{1}{2}$ feet deep with a slight current. The bottom was sand and small gravel. A little way up the gorge we discovered an important series of cataracts and rapids, which, it is believed, are not marked on any map hitherto published. Their origin appears to be due to the intrusion of a broad dyke of porphyry through which the river has had to force a channel. The bed of the cataracts is of solid rock about 100 yards wide, with deep, narrow tortuous channels cut in it through which the water flows in the dry season. During the rains the whole space between the almost vertical cliffs, from 100 to 150 feet high, which form the sides of the gorge, must be a terrific roaring torrent. Wherever waterworn the rock has a highly polished surface, and is of a deep red-brown colour. The scenery in the neighbourhood of the cataracts is very grand and weird. The site is somewhat difficult of access, and the Commission had unfortunately not sufficient time to make a thorough examination of them, nor to determine their total height or length.

The characteristics of the Lundi are very similar to those of the Sabi. At the point where we crossed, it flowed in a bed of very heavy sand about $\frac{1}{4}$ mile broad, the actual stream, however, being only about 40 yards broad and 2 feet deep. Near its junction with the Sabi it becomes much narrower, but is 5 to 6 feet deep. Much of the water brought down by both rivers doubtless percolates through the sand, and is not visible to the eye. The natives as a rule do not take their drinking-water direct from the streams, but from holes which they dig in the sand, and which fill rapidly with water to the level of the surface of the



FALLS AND RAPIDS OF THE SABI RIVER SIX MILES ABOVE ITS JUNCTION WITH THE LUNDI.

river. Numbers of wild geese are to be seen along the river. Fish is very plentiful, and is usually caught by the natives by spearing. There are also hippopotami and crocodiles.

Between the Lundi and the Limpopo, locally called the Umiti, we did not see any streams of running water (September), though we crossed several sand rivers in which water was obtainable either in small reedy pools, or by digging holes to a depth of 4 to 5 feet. The principal of these were the Chefu and the Nuanetsi, both of which eventually join the Limpopo.

These sand rivers are rather a remarkable feature, and vary in breadth from a few yards to more than a quarter of a mile (Nuanetsi). Their surface is nearly level, and consists generally of heavy sand, though occasionally there is some gravel. The banks are well defined, usually from 6 to 10 feet high, and are fringed with fine tall trees and fresh green foliage, very different from the dark-coloured thirsty-looking, stunted bush with which the country between the water-courses is mostly covered. For a short while during and after the rain I was informed that there is running water in some of these sand-rivers, but the total rainfall in this district is very small.

The Limpopo near its junction with the Unyubu (Pafuri) flows through a nearly level alluvial plain about 6 miles broad, enclosed by the scarps of a plateau which rises some hundred feet above it. Close to the river-banks there is a belt of luxuriant forest varying from a few yards to a mile in width, in which a tall, graceful acacia, with a light green bark and yellow blossoms exhaling a most fragrant perfume, is the most conspicuous tree. Where we crossed the river it flowed in a sandy bed altogether about $\frac{3}{4}$ mile broad, in two principal streams, one near the left bank and the other near the right bank. The total breadth of water crossed was about 200 yards, its depth 1 to $1\frac{1}{2}$ feet, and the current 1 to $1\frac{1}{2}$ knots (September). At this ford much of the water must percolate through the sand, as a little lower down the visible volume of water was much greater.

The Unyubu is a pretty stream 40 to 50 yards broad, running between well-defined beautifully-wooded banks. At its junction with the Limpopo there is a deep pool teeming with fish, and containing some crocodiles.

In the district immediately north of Massi-Kessi, which is the meeting-place of the hydrographical basins of the Pungwe, the Busi, and the Sabi, many of the mountains rise to a height of between 6000 and 7000 feet. The most important of them is the great mass of Panga (6970 feet) with its many peaks, enclosing the valley of the Inyamkarara on the west. To the east this valley is shut in by the precipitous slopes of Gorongoe, which culminate in a remarkable sugar-loaf peak 5690 feet high. Lunji (5960 feet) is also a well-defined peak, rising sharply in the shape of a slanting pyramid from a very high

plateau. Mount Doe has a grass-covered dome-shaped peak (6725 feet), but is so surrounded by high ground that it is not much noticed.

The Mahemasemika ridge on the northern side of the Honde River, when seen from the east or west, has a very curious broken and castellated-looking crest-line. At the southern end of it there is a granite pinnacle standing out like a gigantic Cleopatra's Needle.

Mount Zaramira is a sharp-peaked isolated mountain separating the main stream of the Pungwe from the Honde.

North of the Honde River is a very high tableland which includes the Inhangani and the Unyamahomu Mountains. Here the basins of the Pungwe, the Sabi, and the Zambesi all meet.

Looking north from the end of a spur above the Gaeresi, the furthest point reached by the Commission, the country continues excessively mountainous as far as the eye can see. To the north-east and east the mountains soon disappear.

Mount Venga, just north of Massi-Kessi, and a few other peaks are covered with trees to their summits, but the greater portion of the very high ground is grass land, while the valleys, except that of the Revue, and the plains are nearly everywhere covered with forest.

Among the passes on the most frequented routes north of Massi-Kessi the following may be mentioned :—

1. From the Chua valley (Busi basin) to that of the Inyamkarara (Pungwe basin) 4360 feet.

2. From Musawigombe's kraal, west of Mount Tangwe (Pungwe basin), into the valley of the Unjorla, a tributary of the Gaeresi (Zambesi basin) 4700 feet.

3. From the Honde Valley across the watershed between the basins of the Pungwe and the Sabi on the road to Umtasa's kraal, 5260 feet.

4. On the old footpath from Massi-Kessi by the Zambusi Valley (Busi basin) to Umtali (Sabi basin), 4510 feet.

Between Massi-Kessi and the Musapa River the mountains consist of the Udza range, which forms the watershed between the basins of the Busi and the Sabi, and of short ranges running east from the watershed, enclosing narrow valleys between them. Most of these short ranges end somewhat abruptly just west of the road along which the Commission marched. Mount Vumba (4950 feet), at the eastern end of the range running south of the Menini River, with high, precipitous cliffs on its eastern and southern sides, is a conspicuous feature in the landscape, and can be seen from great distances.

Between the Musapa River and the Lusitu the country continues very mountainous. The pass commonly called the Chimanimani Pass, by which the Commission crossed from the Musapa Valley to that of the Great Musapa, is about 5130 feet above the level of the sea.

East of the Harom River is the great mass of the Chimanimani

Mountains, a limestone formation, with sharp peaks, serrated crest-lines, and almost perpendicular bare slopes, totally different in appearance from the grass or forest-covered slopes and peaks of the rest of the country. The highest peaks of the Chimanimani Mountains exceed 7000 feet in height.

South of the Lusitu the country is still very much cut up, but the mountains gradually diminish in height and trend away to the south-west, disappearing almost altogether along the route which we followed from the Umswilizi to the Sabi.

Between the Sabi and the Limpopo we did not see any mountains of importance, the country being generally a nearly level bush-covered plateau.

To give some further idea of the general level of the country it may be mentioned that the height of the new township of Andrade (Massi-Kessi) is about 2500 feet above the sea; that the road thence to the foot of the Chimanimani Pass varies from about 2000 to 3000 feet above the sea; and that the drifts at which the Commission crossed the Lusitu, the Sabi, and the Limpopo, were respectively about 1300 feet, 540 feet, and 600 feet above the sea.

North of the Sabi the forests with which the plains and valleys are covered consist principally of mopane (acacia) trees and wild loquats. The fruit of the latter, which is ripe by the middle of October, has a very delicate aromatic flavour, and is eaten in large quantities both by Europeans and natives. In the country north of the Revue there are in places great numbers of bamboos.

On the march up from the coast to Massi-Kessi we passed a good many palms in the plain which stretches from Mapanda's to Sarmiento. These were principally of two kinds—a stunted nut-palm, and a diminutive date-palm. Elsewhere, except in the valley of the Limpopo, palms were comparatively rare. The palm of the Limpopo produces a wine which, when fresh, has a very pleasant flavour, something between ginger-beer and cider.

In one of the small valleys immediately north of Massi-Kessi there are great numbers of fern-palms.

The Kaffir orange is met with pretty generally throughout the country. The fruit is contained in a hard, green, spherical shell, the interior when ripe being somewhat like a medlar with rather a sickly taste.

Between the Sabi and the Limpopo a fruit is found which, as far as I am aware, seems to be almost unknown elsewhere. In the absence of grain of any kind, owing to the failure of the crops from want of rain in the spring of 1892, it was in use as the staple article of diet of the native population of this ill-favoured district. In outward appearance the fruit is a hard, green, spherical shell, very like the Kaffir orange. The inside consists of a number of brilliant yellow balls with

large stones, something like small plums. To prepare them for food, they are taken out of the shell and steeped for a long while in the water-holes of the river-beds. They are then sun-dried, and subsequently, the stones having been removed, ground into a kind of meal, which has an objectionable smell, reminding one of that of a tan-yard.

Along the Sabi and the Limpopo there are great numbers of huge baobab trees. The interior of the fruit of this tree, commonly called the cream of tartar fruit, is very pleasant to the taste. The tall, graceful acacias with light green bark, which are found along the banks of the Limpopo have already been alluded to. Large quantities of gum exude from the stems of these trees, and it is not improbable that its collection might prove a profitable industry.

The products of the soil cultivated by the natives, include bananas, the castor-oil plant, with hedges of which some of the villages are surrounded, Chili peppers, a very favourite condiment of the natives, tomatoes, sweet potatoes, ground nuts, mealies, Kaffir corn and various kinds of other native grain, the most abundant of which is the red oofoo, tobacco, and non-poisonous manioc. Rice is said to be largely grown in Mashonaland, and to be of excellent quality, but there was very little of it to be seen in the frontier districts traversed by the Commission.

A very noticeable difference between the vegetation of the eastern portion of South Africa and that of the western, is, that whereas in Bechuanaland thorns, often of great size, are almost universal on all trees and bushes, in the country surveyed by the Commission, with the exception of an occasional "wait-a-bit," very few thorns were met with. On the plains and in the valleys after the rains the grass grows to a height of 6 to 10 feet. It decreases in size somewhat with the altitude, and on the tops of the high mountains rarely exceeds 6 feet. This grass not only impedes locomotion, but prevents hunting. In consequence of this as soon as it is dry enough it is burned down. For about two months great veld fires, stretching for miles and miles, and extending to the tops of the mountains, are to be seen in all directions. During this period the atmosphere is usually somewhat thickened by the smoke from these fires.

The distribution of the native population varied much in different parts of the country. Journeying south from Massi-Kessi it is very sparse as far as the Chimanimani Mountains. More than three or four huts are seldom met with together, and these are of the most wretched description. Very little is obtainable in the way of food supplies. The natives have no cattle, and appear to live in dread of a raid by Gungunyane. The women wear a stud in the upper lip, which makes it project in the most hideous fashion.

In the valley of the Great Musapa there is more cultivation. The most-thickly inhabited and prosperous part of the country, however, which we passed through, lies between the Lusitu and the Umswilizi

Rivers. Here the villages are larger, the huts are much better built, there is more cultivation, and large numbers of fowls are reared; there is altogether an air of well-being and comfort.

Gungunyane appears to be acknowledged as the suzerain, but many of the minor chiefs, such as Sechagwa, Mafussi, Shekwanda, Mapungane, etc., are of some importance. Mapungane has some cattle which thrives well on the high plateau on which his main kraal is situated.

South of the Umswilizi the country becomes less fertile and the population again diminishes. Between the Sabi and the Limpopo, owing to the scarcity of water, the smallness of the rainfall and the unproductiveness of the soil, there are very few inhabitants, and these lead a precarious existence. On the return march from the Limpopo to the Sabi, between Luatlatla and the Mahunje (67 miles), we did not see a single hut.

North of Massi-Kessi as far as the Inhangani Mountains, the natives all acknowledge Umtasa as their chief. Cattle are to be seen on the high ground in which the Cho-odzani and Umtali streams rise, but not in any of the valleys of the Pungwe basin, except in those of the Revue and Menini, into which they have recently been imported by Europeans. There are no tsetse fly in these valleys, and attacks by lions and other wild animals appear to be the greatest danger to which the cattle are exposed.

In the valley of the Gaeresi Makombe is acknowledged as chief, but he never visits the country, and the inhabitants know little about him. Umtasa's chief kraal is a large agglomeration of huts at the foot of a nearly vertical cliff. It is in a situation very difficult of access, except from the east, and even on approaching from that direction the huge boulders scattered over the ground would make its defence comparatively easy. The most remarkable kraal that we saw was one on the road from the Honde Valley to Umtasa's, just after crossing the watershed. Here the huts were built on narrow ledges of rock on a precipitous cliff, the top of the roof of one hut being on a level with the floor of the one immediately above it.

All the way from Mount Vumba, a few miles south of Massi-Kessi, to the Limpopo, we did not meet a single white person. Near Gungunyane's old kraal on the Umswilizi there is the residence of a Portuguese half-caste, who is the local sub-agent of the Portuguese Resident at Gungunyane's. North of Massi-Kessi we found two prospectors in the upper valley of the Inyamkarara, but, with this exception, we saw no white man on our march to the Gaeresi.

We did not anywhere meet with any hostility from the natives, but in some places they were at first frightened of us. After becoming assured that we had no intention of harming them, and seeing that we paid liberally for all services rendered (guides, porters, etc.), and for all the supplies which they brought in, they were usually most

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friendly. But few of them were armed with muskets. They always carried assegais, and in addition to this usually bows and poisoned arrows. Skins are largely used as articles of dress.

The native hoe is the only implement of agriculture in use, ploughs being quite unknown. Meal is prepared by first crushing the grain by means of heavy wooden rammers in hollowed-out wooden blocks, and then grinding it by hand between two stones. This work is done entirely by women. Tea and coffee are unknown beverages. Water is the usual drink, but for special occasions beer is brewed from Kaffir corn. Salt is not considered an indispensable article of diet, but is much appreciated wherever it is to be had. Near the Limpopo it is obtained from some saline earths. The process of extraction is as follows:—The earth is dug out of the ground, and then saturated with water to dissolve the salt. The brine thus formed is run off into earthenware jars, and subsequently heated over a fire in shallow dishes, when the water evaporates leaving the salt behind.

No iron was obtained from the country through which we passed, but in some of the villages we saw small native forges with bellows in which bits of old iron were manufactured into assegai and arrow-heads.

Fire-sticks are still used to make fire, the sticks consisting of a straight pointed one of hard wood, and another about two-thirds of an inch in diameter with a very dry pith. The latter is laid horizontally on the ground and held in position by the foot, while the former is placed vertically on it point downward, and is worked rapidly round and round between the hands, downward pressure being applied at the same time. A hole is thus made in the soft stick, and the pith begins to smoulder. By blowing on it and adding a little fine and very dry straw a flame is soon obtained.

With the exception of the Selous Road from Shimoya's to Umtali, two branches from it to Massi-Kessi, and a road made by the Delimitation Commission from Massi-Kessi to a point about 40 miles south, no waggon roads at all exist in the district traversed. The native paths wind about to a most unnecessary and exasperating extent. It is, however, as a rule advisable to keep to them even when the bush is not thick, instead of attempting to march straight across country, for the grass roots are so strong and sharp that they hurt the bare feet of the native porters. Natives always march in Indian file and cross their feet. As a result of this the paths are excessively narrow, and walking on them is most uncomfortable for Europeans.

When proceeding up-country from the Pungwe we did not get clear of the tsetse fly till we reached Shimoya's. Thence to Massi-Kessi ox-waggons brought down from Mashonaland were able to work along the road. South of Massi-Kessi, the only place in which we came across the fly was in the neighbourhood of the Sabi. Five ponies which we took with us from Natal all died, or had to be shot within six weeks of

their landing at Beira. We also lost from fly-bite every one of twelve oxen which made the journey from Shimoya's to Mandigo's and back, a section of the Beira Massi-Kessi road, which till the commencement of 1892 was believed to be free from fly. Even when there is no fly horses are apt to succumb, for they have another deadly enemy to contend with in the mysterious "horse-sickness," so prevalent in many parts of South Africa, and none but salted horses should be used. The grass is usually so coarse as to be bad feeding, and the great difficulty, if one has horses, is to get sufficient mealies for their requirements.

The great coast plain between Beira and Sarmento teems with large game. The varieties met with in greatest numbers are the buffalo, water-buck (peevah), quagga, and hartebeest. There are said to be still some elephants within a comparatively short distance of Mapanda's. On the march from Massi-Kessi to the south most game was seen between the Chimanimani Pass and the Umswilizi River. It included eland, buffalo, hartebeest, wildebeest, bush-buck, reed-buck, quagga, sable antelope, blue buck, red antelope, and wild boar. Between the Limpopo and the Sabi we came across the spoor of giraffe, but did not see any of the animals. Hippopotami were found in the Pungwe, and its tributary the Honde, and also in the Umswilizi and the Sabi. Of edible birds those most frequently seen were the guinea-fowl and varieties of the dove, which were generally to be found in the vicinity of growing crops. Near the Sabi a hooded guinea-fowl was shot. Water-fowl, including wild geese and duck, are numerous on the Sabi, the Lundi and the Limpopo.

The wild animals met with included lions, leopards, commonly called tigers, hyænas, tiger cats, and jackals. The presence of crocodiles in the rivers has already been alluded to.

Snakes were much less numerous than had been anticipated. No accident from snake-bite happened to any member of the Delimitation Commission, either European or native (total strength nearly two hundred), during the whole seven months it was in the country. The only snakes that I saw personally were some puff adders, and a long snake of very small girth, the name of which I was not able to ascertain.

THE LIMITS BETWEEN GEOLOGY AND PHYSICAL GEOGRAPHY.

A discussion on the relation between Geology and Physical Geography took place between Sections C (Geology), and E (Geography), of the British Association at Nottingham, on Friday, September 15th, in the meeting-room of Section E. By the permission of the presidents of both sections, the chair was taken by Sir Archibald Geikie, F.R.S., who

said that he consented to preside in the hope that the meeting might be able to evolve from the discussion some clear conception of the mutual relations of Geography and Geology.

Mr. Clements R. Markham, C.B., F.R.S., President of the Royal Geographical Society, opened the discussion by reading the following paper:—

Knowledge is one, and its division into what we call sciences is necessary, because no human being was ever so gifted as to grasp it as a whole, and also to acquire a special acquaintance with all its parts. A division of labour is inevitable, and the bounds of each division must be more or less arbitrary. At the same time there is no reason why those limits should not be fixed by common agreement, and upon grounds that would receive assent from expert and intelligent criticism.

In considering the boundary-line between geology and physical geography, I approach the subject as a geographer, and I look at it from a geographical point of view; but if my conclusions are in the main correct, they will be accepted by geologists because, although our points of vision are not the same, the impressions we receive are caused by identical phenomena. From a central geographical position I believe that the limits of our science may be defined; distinguishing between the subjects which are within our boundary, and those which, although clearly belonging to another division of knowledge, are still pertinent to our enquiries.

I have no doubt of the utility of such definitions. While each seeker after knowledge should work within the defined limits of his own special science, it should also be his aim to generalise and to bring out its relations with other spheres of enquiry. In both lines of study and of thought he will receive assistance from clear and acknowledged definitions of the scope of each science; for he will thus find guidance with regard alike to the methods and to the extent of his researches.

Geography was the first science, the mother of all the sciences, the astronomy of the ancients being mainly mathematical geography. With the ancients as with us the work of geographers was to measure all parts of the Earth and sea, and to fix the relative positions of all places on the Earth's surface. Locality is the basis upon which nearly all human knowledge rests, and it is one of the priceless gifts which geography supplies to her daughter sciences. We first establish the locality, and then we study the phenomena within a given area, and the changes which have taken place during historical times, that is, the changes respecting which there is human testimony in some shape or form, not necessarily written testimony. These changes generally explain to us the laws according to which similar changes are now taking place around us. This is physical geography. From the point of view of its connection with physical geography, I take geology to be a study of the condition of the Earth, and of the changes that have

taken place on its surface during the cycles of ages previous to the dawn of history. Sir Roderick Murchison used to say that the geologist was the physical geographer of former periods. When he studies the phenomena of physical geography it is to collect data which will enable him to solve some problem of remote ages. The geologist and the geographer use the same materials but for different purposes; the former to find interpretations of problems relating to the past, the latter to explain what is actually taking place in the present.

There is thus a definite boundary between the two sciences, although, as we have seen, each has occasion to use arguments derived from the other, in order to find interpretations or explanations for its own problems.

The physical geographer certainly has to learn from geology the influence that the nature of the various rocks and their present positions has had, and still has on the features of the Earth's surface as we now see them. For instance, the causes which decide the direction of river-beds can generally be ascertained by a study of the nature of the rocks, and of their inclinations round the fountains and along the river-courses. But the objects of such study are different from those of the geologist; and no geological facts or arguments come within the sphere of the geographer's work unless they help to explain an existing feature. The aid derived by the closely allied sciences from each other does not interfere with the enunciation of a distinct limit between them. I believe this boundary-line is to be found where human testimony ceases. Geography fixes localities. It finds certain physical phenomena peculiar to each locality and it seeks for their causes. In such research the two sciences of geology and geography are on common ground; but while the object of the former is to obtain explanations of phenomena in the remote past, that of the latter is to seek reasons, from the testimony of history, for the condition of the locality as the geographer sees it before him. Generally such human testimony is sufficient for his purpose. When it is not, he seeks for explanations within the domains of geology, of biology, of meteorology, sometimes even of astronomy; but such necessity to go further afield does not vitiate the accuracy of a definition which sets proper limits to his own science. It merely reminds him of the great truth that knowledge is one, that it is one harmonious whole, and that the divisions into special sciences are the inevitable consequence of the limits which circumscribe the powers of the human mind. Humanity must acknowledge to itself that as knowledge extends, these limits become more evident, and sub-divisions become more urgent. In common with other sciences, geography finds the necessity for specialism, while the sub-divisions within itself render clear definitions of its outer limits more desirable and more useful.

My own studies have been chiefly in the direction of comparative geography, and I have sought for the explanation of existing conditions

of the Earth's surface by examining the records of former centuries. On one hand, such special studies lead to an appreciation of the necessary connection between physical and political geography: of the fact that a consideration of the influence of the configuration of the surface, of climate, and of products must form the basis of a study of the history of man. On the other hand, they furnish explanations of the existing condition of the surface, and suggest that definition of the boundary between geology and geography which I now submit.

In order to test the application of a canon intended to define the boundary line of the two sciences, it will be well to select some given area for the purpose. The great valleys of the Ganges and the Indus will be suitable. If we go back to the earliest human records, we shall find that the chief centre of power was on the water-parting between the Jumna and the Sutlej. All the rest of the present valley of the Ganges was then less suitable for settlement. The vast region between Delhi and Calcutta has become populous within the historical period. As dynasty succeeded dynasty, we find the foundation of cities recorded in situations lower and lower down the valley. The physical geographer compares the records of history with what he can now see with his own eyes. The process that is going on is described by Mr. H. F. Blanford. Standing on the banks of the Ganges, and watching the turbid flood swirling past, the observer sees the *chur* opposite, which the river left dry when its waters fell at the close of the last rainy season. Until lately it was covered by a rich green crop of indigo. It is now more than half cut away and buried beneath the waters. Huge masses detach themselves from time to time and are swallowed up by the deep muddy stream. These are present facts. The enquirer then learns that half a century ago the river itself was only a moderate-sized *khall*, and that an old channel, 7 or 8 miles off, and now little more than a string of pools, was at that time a great river. Turning to history, he will find that the ancient records of the people gradually unfold the causes and effects of what he has seen and heard. The positions of the capitals of the different dynasties which successively reigned in the valley plainly continue the story, until the Vedas are reached. Then the whole wonderful record is unfolded through the help of human testimony. It is all within the domain of geography, up to the causes which led to the disappearance of the Saraswati and to the alterations of the courses of the Sutlej and the Jumna. The more remote record represented by the mountains bordering on the valley, by the Sawalakh hills and their fossils belongs to geology. Here the reasons for drawing the boundary line between the two sciences stand out clearly defined. All that comes within the ken of human testimony belongs to geography; the earlier pages contain the changes indicated by positions of strata, and the story told by the Sawalakh fossils, and are a part of the science of geology.

If we come nearer home we see how the remarkable phenomena connected with the long battle between the land and the sea, at the delta of the Rhine, teaches another memorable lesson in physical geography, with the aid of history. We see what is going on now, the dunes protecting Holland from destruction, the Zuyder Zee, the numerous islands, and the tracts of reclaimed land. Human testimony explains the causes which produced the present condition of this region, and the gradual changes in the course of centuries. The slow movement of the dunes is revealed to us by the statue and temple of Nehelennia, which was uncovered some years ago on the Domburg Sands. A drive of 12 miles northwards from Bruges conducts the enquirer to the little country town of Sluys, which is surrounded as far as the eye can reach with cornfields and meadows, and clumps of tall trees. The student of Froissart reads how our King Edward III. gained a great naval victory over the French fleet on this very spot. If he continues his researches and studies the narratives of the great struggle between the United Provinces and Philip II. of Spain, he will find that a change had slowly but surely been taking place. Sluys is still a port, but with very different surroundings from the Sluys of the 14th century. From that time he may trace its story, with the aid of a succession of maps, down to the present day. This is physical geography, explained and illustrated by the aid of history. The earlier record of the same region when the mouth of the Rhine was somewhere in the latitude of the Orkneys, and the river-drift men tenanted what was then a part of a continent—but is now the Island of Britain, as distinctly belongs to geology. The interesting facts connected with it are not ascertained by human testimony, but by other methods and for other objects. Here again we find a natural boundary-line between geology and geography, by means of which the whole body of facts relating to a locality can be logically divided between the two sciences, and conveniently classified.

History, as well as the voyages and travels of former explorers, teaches many a fact of the greatest interest to the physical geographer. At the Pass of Thermopylæ he can study the topography of the Persian campaign, and fix the spot where Leonidas made his final stand; while at the same time he can trace the progress of the extensive changes in that region down to the present day. On the rock of Mont St. Michel he can watch the progress of the high tides until the place where he stands is converted into an island. History tells him that this mount, a college of Druidesses and later a temple of Jupiter, was in the centre of a great forest, the *Seliacum nemus*, in Roman times. Here, in this very county, the native of Nottingham may descend his own river of Trent, and come to a great cultivated district which was once Hatfield Chase, a wild tract of forest and moor, intersected by water-courses and dotted with large pools and swamps. The tomb at York

Minster tells us that young Prince William, the son of Edward III., met his death in Hatfield Chase; he caught an ague when his father was hunting deer, from a boat, in the marshes. In this instance the change is due to human agency, but that change is equally a part of physical geography, and the geographer traces its progress through the study of historical documents. Still more important changes have been caused in the countries bordering on the Mediterranean, partly through meteorological agents and partly through the work of man. In many places the cactus and the aloe have usurped the ground occupied in classic times by forests of oak and beech. We know, from the evidence of historical documents, that the mountains bordering on the garden of Murcia in Spain, which are now naked rocks rising in peaks and ridges, were once, and not longer ago than in the days of Alfonso the Wise, clothed to their summits with pine-woods.

It is thus that physical geography finds most efficient assistance from human testimony for the study of the former state of parts of the Earth's surface, at different epochs, which led to their present condition. It need not always be written testimony. The splendid temples of Selinunte on the south coast of Sicily, and the direction in which they have been thrown down, are the silent witnesses to a great earthquake in the eighth century. We have seen, too, how the statue of the goddess Nehelennia explained the direction and rate of movement of the sand-dunes of Zeeland.

It is this testimony respecting the condition of the Earth's surface at long intervals of time which gives such importance to the editing and the study of old voyages and travels. Hence every physical geographer ought to be a member of the Hakluyt Society. By careful reading, and by knowing what he wants, he will pick many a plum out of the heaviest pudding. But, in truth, the quaint old narrators of voyages and travels are very rarely dull. The student of physical geography is sure to be rewarded by their perusal. He may be giving his attention to the formation of coral islands, and perhaps meditating on the question whether Bermuda once formed a great circle of land enclosing a lagoon. The existing evidence is the small west rock on the western reef gradually being reduced in size by the action of the waves. Further evidence of the dimensions of this rock in former times would be important. A man named Henry May went out as a mate with Lancaster in his first voyage to the East Indies, three centuries ago. May lost his ship somewhere near Puerto Rico on his return voyage; and took a passage home in a French vessel. He was shipwrecked on the western reef of Bermuda, and his journal supplies evidence respecting that west rock. He describes that land as consisting in his time of "high cliffs." Further research may reveal its dimensions at some other period, and so help the researches of geographers; for the narrative of Bermudez, the discoverer of this coral group, is still buried in Spanish

archives. Mr. Woodford has mentioned to me how, in the same way, a passage in the journal of an officer serving under Mendaña in 1567, explained to him a change on the coast of Guadalcanar, one of the Solomon Islands.

When the explorer makes new discoveries, their true significance can only be established by the testimony of history. The region round Lake Zuwaya to the south of Abyssinia is almost unknown, and is consequently very interesting to geographers. It was unvisited for centuries, and Mr. Ravenstein, our greatest authority on Africa, has to go back to the enterprises of the Portuguese to find any trace of a visit to it. Thus it is that we appreciate the value of the narrative of Father Alvarez, who accompanied the embassy of Rodrigo da Lima to Prester John; for one of the members of this embassy, in a journey to the southward of Abyssinia, described the lake, which has again been revealed to us by modern travellers after an interval of three centuries.

Instances need not be further multiplied to prove that the alterations of the Earth's surface, which properly engage the attention of the physical geographer, rest upon human testimony—upon history and the records of voyages and travels. What applies to changes caused by the action of water, is equally true of the volcanic irruptions and subterraneous forces to which the surface of the Earth is subject. Some of these phenomena belong wholly to geology, while others have expended themselves in historic times, or are now actually at work. The great volcanic region of Auvergne belongs entirely to geology. Geography is merely concerned with it, with reference to its actual physical aspects, and their relation to existing results. Its formation and history is beyond the domain of human testimony, and, therefore, of physical geography. The irruptions of Vesuvius, on the other hand, are purely geographical, although their study is important to geologists; because the first appearance of activity took place in historic times, and its subsequent action is fully recorded. The same remark applies to the greater part of the mighty volcanic belt of fire from New Zealand to Japan.

Earthquakes compose another series of phenomena which belong to geology or to geography, as they occurred before or after the dawn of human testimony. Seismology is a department of geography, and the record of earthquake phenomena can only be completed by researches into the history of the past. The colonial records, in the Spanish archives, thus enable us to form a descriptive list of the earthquake phenomena on the western coast of South America for the last three centuries; and similar chronological series can be gathered from historical documents as regards several other parts of the world. In all these departments the line between geology and geography can be defined without strain or danger of confusion; and the result of the consideration of the question of limits, from this point of view, seems

to be that it can be settled naturally and without undue concession on either side.

There are doubtless many other considerations which I have overlooked, and which should be marshalled in order, and be given their proper weight. This may be done in the course of a discussion; and the final event may modify or set aside my conclusions. I speak only as a comparative geographer, and from a special standpoint. Geologists may not improbably see the same facts from a different point of view, which will lead them to other conclusions. I believe, however, that such differences will only apply to details, and that a final conclusion may easily be reached by mutual agreement. For we must recollect that, although knowledge is one, the limits of all our divisions of knowledge must inevitably represent a series of compromises.

Meanwhile, and until better instructed, I should define GEOLOGY as the study of the condition of the Earth and of the changes on its surface during the cycles of ages before the dawn of history; and I should define PHYSICAL GEOGRAPHY as a knowledge of the Earth as it is, and of the changes which have taken place on its surface during historical times. These changes, derived from human testimony, explain to us the laws according to which similar changes are now taking place around us.

The two sciences depend upon each other and are very closely allied. The geologist finds the same phenomena in the rock formations of the past as the physical geographer discovers on the surface of the Earth of the present. Both, for example, have the duty laid upon them of seeking out the agencies which rule in the processes of upheaval and depression, as described by Professor Lapworth in his masterly address to the Geological Section of the British Association last year. The fold, with its crest and trough, is common to both sciences; and geographers have rejoiced at Professor Lapworth's announcement of "a wedding-ring of geology and geography uniting them at once and for ever in indissoluble union," while they preserve their separate existences and work out their problems by different methods.

Mr. W. TOPLEY, F.R.S., of the Geological Survey, gave a demonstration, by reference to actual cases, of what he believed to be the relation between geography and geology, and summed up his argument as follows:—

Professor Lapworth in his address to the Geological Section last year at Edinburgh showed clearly the close relationship of geology to physical geography as regards the larger features of the Earth's surface, the structure and distribution of mountain chains, the great folds which traverse the Earth's crust, and the wider areas of uplift and depression. I propose to refer mainly to the minor features of the surface, and to show that the nature and "lie" of the rocks determine these surface

features. From this point of view geology forms the basis of physical geography, and a geographer must necessarily be to some extent a geologist. There is no need to point out that the converse of this is equally true. A geologist who would understand in what way existing geological conditions have been brought about, how strata have been deposited, volcanic rocks erupted, and how denudation has carved the surface into its present shape, must study similar phenomena now in progress.

A comparison of geological and physical maps of any area at once shows that different rock-groups and formations present different types of land; the hills and mountain chains coinciding with the outcrops of certain rocks or strata, whilst other formations are characterised by plains or by low-lands. It is thus clear that the geological structure of any district determines its physical geography. This relation is equally apparent when we compare the structure and surface features in detail. The older masses of rock frequently form mountainous land; the newer palæozoic and the secondary rocks occur mainly on a succession of plains and escarpments, each determined by the outcrop of certain beds.

The history of valleys, plains, and gorges, can only be understood by reference to their geology. We then see why rivers, after for awhile running over wide open plains, suddenly break through hill-ranges, cutting the escarpments at right angles; the explanation being that the streams began their work when the whole formed a comparatively even surface, the existing features being due to long-continued erosion. The escarpments, plains, and transverse river-valleys of Central and Southern England, and of Eastern France, form excellent examples of this structure. Here the geology is simple, a fairly continuous dip in one direction and different beds cropping out from beneath each other, in definite order. On the flanks of mountain chains this simple structure does not hold good; there the beds are frequently contorted, inverted, and thrust over each other, so that a superficial reading of the geology would give erroneous results as to the order of succession. But even here the present "lie" of the beds has determined the physical geography, the disturbances of the rocks having been produced when they were deeply covered by other strata, now removed by denudation. Some igneous rocks weather into conical hills resembling volcanic cones. The same thing often occurs in the weathering of sands, whilst sand is frequently blown into conical and crater-shaped hills. A hasty glance at the outward shape of such hills might mislead a traveller. Many conical hills in the south of Scotland are old volcanic vents, up which molten lava once came; but the true volcanic cones have been long since removed by denudation, and what we now see are only the once deeply seated "necks" of the old volcanoes, the softer strata having been worn away. Caution is necessary in interpreting the apparent *dip* of strata as a means of determining geological structure; besides foldings and

inversions, already referred to, we have to guard against being deceived by cleavage, false bedding, etc. The "fan-shaped" structure of many mountain chains offers a well-marked case of folding and inversion.

A knowledge of the geological structure of certain rocks in any one area may mislead when applied to distant districts. The soft clays, thin limestones, and sandstones of the Jurassic rocks of England, are represented in the south and east of Europe by thick masses of limestone, forming prominent mountain ranges; whilst the soft Triassic rocks of England are represented in the Alpine area by huge masses of limestone and dolomite, with intermediate softer bands, and with layers of volcanic rock. Even within so small an area as England we have differences in lithological composition, making differences in physical geography. The high and barren moorlands of north-east Yorkshire and the fertile districts of the Cotteswold Hills are both composed of Lower Oolitic rocks; in the former they are sandstones and shales, in the latter they are in great part soft limestones and clays. The nature of the rock determines the character of the soils and vegetation, the soils being due to the decomposition of the underlying rocks. This is not however the case where the solid rocks are covered by drift deposits; here the soils are formed by the decomposition of the drifts.

The sites of early settlements and villages are generally determined by geological surface-conditions, water, and a dry and fairly fertile soil, being required. The land divisions resulting from these early settlements are in like manner dependent on the physical features, which however are not usually the actual boundaries of the parishes, townships, etc. But where the hills are exceptionally high, the summit, or the local water parting, is often the boundary.

The "limits" of geology and physical geography are indefinite; the two sciences shading off into each other and interlacing over a wide borderland common to both.

Mr. E. G. RAVENSTEIN said: After the very excellent and reasonable addresses which we have listened to from Mr. Clements Markham and Mr. Topley, there remains very little for me to say. I may at once acknowledge that I agree with them in all the main points. Some years ago when the same subject was under discussion with a view to the establishment of professorships of geography at our universities, certain geologists were far from showing the same moderation in advancing their claims. It was indeed claimed in that day that physical geography at all events constituted merely a subordinate department of geology, and that there existed consequently no necessity for establishing new professorships. I maintain that geology holds the same relation to physical geography as history does to political geography. Both the physical geographer and the geologist start from the present period, but whilst the geologist goes backwards, and reveals to us the physical history of

our Earth, the geographer concerns himself with existing conditions only. As Mr. Markham said very appositely, he endeavours to present to us a truthful and complete picture of the existing surface features of our Earth, whilst noting and studying at the same time all those changes which are going on under our eyes, or which are known to have been going on within historical times. As a geographer I am interested, for instance, rather in the mineralogical character of the rocks, their arrangement, than their age. The question of the age of certain Scotch rocks, which some years ago agitated the geological world, did not concern us as geographers. On the other hand, and looking to the second great department of our subject, namely, political geography, which studies the Earth as the abode of men, we are very much interested to know whether these rocks supply a fertile soil or are merely capable of giving sustenance to a poor and stunted vegetation; whether they are pervious, like chalk, or impervious clay; whether by their mass or disposition they hinder or promote intercourse between neighbouring regions. I quite agree with Mr. Topley that the knowledge gathered by the geologist will immensely help us in a thorough understanding of the existing physical features of the Earth, just as the researches of the historian throw light upon and illustrate the political geography of the various countries. I do not think that it will be possible or advisable to draw a hard-and-fast line which is to divide the domain of the geologist from that of the physical geographer. There is some common ground between us, and I feel sure we shall not quarrel over it. If the geologist affords us glimpses into the past, we shall gladly avail ourselves of his services, just as he, in his turn, would make use of those researches which are recognised as being strictly geographical.

Professor LAPWORTH, F.R.S., said: I came here, like most of you, not as a teacher, but as a learner. To stratigraphical geologists, like myself, physical geography and geology seem to merge insensibly the one into the other. While I admit the theoretical correctness of the line of separation drawn by Mr. Markham, it appears to me that physical geography enters into stratigraphical geology, and is actually part and parcel of it. Physical geography is the geography of the present, stratigraphical geology is the geography of the past; the one is impossible of full comprehension without a knowledge of the other. The geologist is indebted on all occasions to the physical geographer for assistance. If the stratigraphical geologist, in working through a formation, discovers a bed of pebbles, he turns to geography for a description of its mode of origin. If he finds red sandstones, he in some way or other obtains from geography a correct description of the manner in which such sands are forming at the present day. If, indeed, the stratigraphical geologist wishes to complete his information regarding the mode of origin of any stratum whatever, he turns to the

description of the formation of similar sheets in modern physical geography. The information he receives becomes part of himself and part of his subject; so that, in the course of time, he feels bound to consider the two sciences as more or less identical. Our science of stratigraphical geology is based on that of physical geography. Every phenomenon we discover in the rocks, we interpret, if possible, by known facts in physical geography. The never-failing bank of physical geography has given us, so to speak, the current coin of geographical facts which we employ in all our theoretical speculations. As Mr. Teall showed in his address to Section C, whenever we have attempted to interpret or to speculate by any other means, we have always come to grief, and have been forced back upon the hard and accepted facts of recent physical geography. So much for the indebtedness of the geologist to the geographer. Now the geographer, on the other hand, very rarely indeed turns to his brother, the stratigraphical geologist, and asks for some return for all these benefits. But the geologist is willing to pay the bill whenever it is presented. When that is done, then it appears to me that physical geography will rise to a far greater height than it has yet risen, and no physical geography text-book will ever be published unless it contains, not only a description of countries and their climatic phenomena, but also an account of their geological history. Mr. Topley gave several illustrations of the relations between physical geography and geology, and as I was looking at his geological map of France, it struck me that I might give you an extra one. When the geographer gives you a description of France he tells you that it consists of two large open valley-plains, sloping westwards, one in the north, and one in the south; and that, in addition, there is a long and narrow valley in the east, running south to the Mediterranean. Next he tells us how these three valleys are divided from each other by broad rising grounds in the centre, and are towered over by vast mountain chains to the east and south. Then he goes on very properly to explain how the drainage, the climate, and the productions are all affected by this disposition of the ground. Every fact and theory of explanatory value which he can worm out of the chemist, the physicist, the meteorologist, the agriculturalist and the like, is utilised carefully in his text-book; but he rarely or never asks the geologist a single question. The physical geographer contents himself with describing the form of the surface of the country itself, and the relationship of that form to the rest. He never attempts to explain how that surface arose, what is its history, and what its relationships. Now the geologist, who is also a physical geographer, can go further, and explain the origin and meaning of these surface features. He knows that these three great valleys are old sea-floors lying in the laps of three great crust-folds, and that the relative widths of these valleys their slopes, their soils, their features, all depend upon the degree to

which their boundary ridges have been crushed up into mountain chains. Even the direction and structure of the mountains are dependent upon the history of the rocks of which the country is built: every detail of surface form becomes explained when once physical geography and geology are united. It would take me far too long to show you how in other cases this geological map illustrates similar points on physical geography; but it is my conviction that the day is coming when the geographer will turn to the geologist for information as naturally as does the biologist. When less than a hundred years ago the geologist began the study of fossils, and found that they were the relics of organised creatures, and were bound up with the living beings of the present day, then biology was born as a truly great science. At the present time, largely because of its union with paleontology, biology is advancing with the most marvellous rapidity; for in addition to studying living creatures as they now exist, the biologist is able to study the historical development of such creatures through the long ages of the past. I believe that it will be precisely the same when geology and geography are welded more closely together. The physical geographer will study the past geography of the world as carefully as he studies the present, and the science will then undergo a complete renaissance. I look forward to the time when the physical geographer, who knows nothing of stratigraphical geology, will be consigned by the geologist to his museum of extinct monsters, and the geologist who has no knowledge of and gratitude to physical geography, will be looked upon by the geographer as a candidate for a lunatic asylum.

Dr. VALENTINE BALL, C.B., F.R.S., said: Being connected as I am officially with the administration of a school of art, I feel that the case of geography and geology may be compared to that of art and anatomy. In the case of art-students we require a study of anatomy, and I think that the education of geographical students should require a thorough study of the principles of geology, which has been well described as the anatomy of the Earth. With regard to the remark made by Mr. Ravenstein as to the debt the geologist owes to the geographer, I may say from my past experience as a field geologist in India, that while feeling the greatest gratitude to those geographers or map constructors who had compiled faithful representations of the physical features of the country which I explored as a geologist, I cannot speak in too strong words of condemnation of those who produced bad maps in which imaginary physical features were inserted.

Dr. R. D. ROBERTS (of the London University Extension Society), said: There seem to me very great advantages in stating the question under discussion in the form adopted by Mr. Topley rather than in that of Mr. Markham. It is better to treat the matter as a discussion of the

relations between physical geography and geology, than as a definition of limits. Defining limits and frontiers always to my mind suggests the approach of antagonistic bodies, and anything which tends to suggest the idea that there is some sort of hostility or antagonism between physical geography and geology is most undesirable. The relationship is merely one of time, of the present and the past. The object of the stratigraphical geologist is to unfold the condition of the Earth at different stages of the past, in other words, to reconstruct the old physical geography. The Earth as it is to-day is the result of evolution; we want as vivid and complete a picture as possible of every stage in that evolution from the beginning up to the present time. And although we cannot hope that geology will ever become so absolutely completed, yet from year to year we shall approximate to a complete history of the Earth—the succession of its old physical geographies. No kind of distinction can be admitted between physical geography and geology except one of time. I cannot see how, if physical geography is merely an account of the present phase of the history of the Earth, it can possibly rank as a special science? We have not yet the materials for the restoration of the old physical geographies as we have for the study of the actual physical conditions. A time may come when just as we have now scientific men who are specialists in the existing physical geography, we may have specialists in the physical geography of each geological period.

Dr. H. R. MILL said: It is surely unnecessary to contend that the definition of limits suggests opposition. The question is one merely of deciding what is the most natural cleavage by which the portions of knowledge pursued by different specialists may be marked off. However advantageous the chronological dividing line may be philosophically, it is scarcely of practical utility, as the studies of specialists could not possibly be circumscribed by so arbitrary a division. In common with previous speakers I feel that geology and physical geography to a large extent interpenetrate each other, and that the two sciences cannot be easily divided by any restriction of the field of one or of the other. But a very obvious distinction may be drawn in another way. The phenomena considered by physical geography and geology are in great part the same, but they are considered from a different aspect. In physical geography we require to borrow many conclusions from geology, but we do not on that account work by purely geological methods. Some parts of geology constitutes part of the food of physical geology, but they are combined with other elements, assimilated and built up into the body of geography. Thus geography preserves a distinct individuality and is capable of definition. Physical geography strictly speaking has to do with the discovery and description of surface forms, and for all information regarding the composition or classes of rocks it accepts

the conclusions of geology, placing these in such a light as to explain surface features and predict the probable immediate surface changes.

Mr. H. YULE OLDHAM, Lecturer on Geography at Cambridge, said: We must not let it be imagined that physical geography is the whole of geography, although it lies at the base of the science. The relation between geography as a whole and geology should not be overlooked. Mr. Markham brought out well the importance of the historical aspect of this question. I do not think the suggestion that a time is coming when geology and physical geography will be completely fused, is likely to be realised. In all branches of science the rapid increase of knowledge has caused a tendency towards sub-division rather than assimilation. It is becoming more and more important that the two sciences should be separately treated, and we in this country have much to learn from our friends on the continent who have fully recognised the importance of geography as the subject of special University professorships and examinations.

Professor BONNEY, F.R.S., said: It seems to me, that according to the wording, this discussion is a search after the unattainable, which as a general thing is not satisfactory. Everything I might have had to say has been already said by previous speakers. Speaking of the limits between geography and geology seems to me something like speaking of the limits between a river and the sea. The sea is one thing and the river another, but who shall say exactly where their limit is. The whole question either lies in a nutshell or admits of endless discussion. The broad distinction is laid down by the names themselves—geography and geology. The one partakes more of the nature of an art, and the other more of the nature of a science. Geography deals with the description of phenomena, geology rather with the interpretation of phenomena. But it is quite obvious that you cannot get good descriptions without having some knowledge of what you are seeking for, that is to say without collecting facts in a scientific spirit, and this, it seems to me, has been admitted again and again by many of the previous speakers. And so I think that while the ground is to a certain extent distinct, there is a common field on which you must meet and join hands, and when you can be of the highest service one to another. It seems to me that Mr. Markham emphasised the matter well, when he said geography was rather concerned with the present, and geology with the past. The geologist takes facts from the present, using them towards the interpretation of the past, while the geographer has the advantage of that interpretation, and of that which is before his eyes. There are, however, some parts of their subjects which are pretty well distinguished. For example, the geographer concerns himself not at all, or in the smallest degree, with paleontology. The geographer is concerned rather with the general results of mineralogy than with the details of it. Again the

geologist is not concerned with the making of maps; that is the business of the geographer, but the geologist is infinitely indebted to the geographer who will supply him with good maps. So then it seems to me the needs and aims are to a certain extent different, and the motives of the two are also different, but that there is between them a large common ground where they may work together harmoniously and mutually assist one another.

Mr. J. Y. BUCHANAN, F.R.S., said: Geography and geology have always appeared to me to be very nearly allied; but their separate existence is recognised by geology occupying a section of its own. There are other subjects allied to geography, and I mean physical geography, which occupy a less satisfactory position.

We have long had the physical geography of the land; we have now in oceanography the physical geography of the sea; and in meteorology and climatology we have the physical geography of the atmosphere. Oceanography has already been recognised by the sitting of a joint section of Sections B and E at the last Edinburgh meeting. The position of meteorology is anomalous, because it is included among the subjects of Section A. This section, however, is so crowded with physical work from the laboratories that open-air work has difficulty in securing a hearing. It seems to me that, along with climatology, it ought to come into the section of geography.

Colonel GODWIN-AUSTEN, F.R.S., said: I cannot see myself how it is possible to define the limits between physical geography and geology, for as Mr. Topley so well expressed it, the two dovetail, so far the one into the other. Mr. Oldham has said very justly that at the present day there is a tendency for all sciences to be broken up into different sections, a sort of specialisation, but I think it would be to the detriment of all the sciences if they were to be bounded by any hard-and-fast lines. Mr. Markham laid great stress in his paper on the limits to be defined by historical time, but if we did that I do not see how it is possible to draw that hard-and-fast line, on account of the different range of history in different continents, for instance, in India, Australia, and Egypt. It is most difficult to draw any line. I think it is also shown in books of travel, and I would allude, for instance, to that excellent one, 'Travels in the Himalaya,' by Sir William Hooker, that the more scientific the traveller, the more interesting is the result of his labours in the field.

Sir ARCHIBALD GEIKIE, in summing up the discussion, said: Having, as I may say, one foot in geology and another in geography, I have sympathy with the desire expressed by the geographer to find some satisfactory limit between his branch of inquiry and geology. At the same time I feel strongly with the geologist that any line of division drawn between the two subjects must be an artificial one, the adoption

of which must be determined almost entirely as a matter of convenience. If it be convenient to geographers to draw the line proposed by Mr. Markham, by all means let them do so, but they can hardly expect that geologists will be content to recognise that line as defining their own territory. Since geology may be regarded as the history of this Earth, whatever is necessary for the elucidation of that history will be claimed by the geologists as part of their domain. Only as they understand what is going on at the present day can they ascertain what took place in past time. If you take away from the geologist the study of all that is taking place now, and maintain that this study is not geology but physical geography, he will answer, "I do not care what you call it, I must be at liberty to investigate the processes that are operating now in order that I may be able to explain what has happened in past time." But there is another point of view which shows how inextricably interwoven are the tasks of the geographer and the geologist. Not only is the present the key to the past, but it is equally true that the past is the key to the present. I do not think that this aspect of the question is sufficiently recognised with regard to the present surface features of the globe. The subject has been referred to by several speakers, but much detailed work is needed to show how the present surface of a country has been shaped. The history of a land-surface is often a long and complicated one, only decipherable with all the helps that modern geology can supply. I think it hardly possible to draw a line of division that shall be entirely satisfactory to both classes of investigators. Such a hard-and-fast line between the respective sciences does not appear to me to be either necessary or desirable. Good progress has already been made without it, and, even if it remains still undrawn, I cannot doubt that in the future, as in the past, geographers and geologists will co-operate cordially in promoting the advance of truth and knowledge.

EAST AFRICA—MR. ASTOR CHANLER'S EXPEDITION— LIEUT. VON HÖHNEL.

THE following communication, dated Daicho,* September 20th, 1893, has been received at the Society from Mr. W. Astor Chanler. The unfortunate accident to Lieut. von Höhnel is to be deplored. Though it has compelled him to return to Europe, Mr. Astor Chanler has determined, it will be seen, to carry out his expedition:—

This letter is taken to the coast by the men who are carrying my

* No doubt the "Dhaicho" of Lieut. von Höhnel's, in Vol. I. *Geographical Journal*, p. 576. It lies north-east of Mount Kenia, a few miles north of the Equator, and about 38° 14' E. longitude.

companion, Lieut. von Höhnel, who was severely injured by a rhinoceros on August 26th. His wound is a serious one, and necessitates his immediate return to Europe. My grief at this accident will be easily understood, and I feel sure it will be shared by all who have the interest of geography at heart. Without Lieut. von Höhnel's assistance and skill, what information I can give you will, I fear, be worth little. However, I shall continue my journey, and hope, with a little good fortune, to be able to throw some light, at least upon the manners and customs of the peoples living to the north of this place.

I will now give you an account of our work since my last letter written in June. We left Daicho with sixty-eight men on June 5th. We returned to this place on September 18th. Lieut. von Höhnel up to the time of his accident made a thorough map of all the country traversed. He has promised to send you a copy of this map as soon as he has completed it. Our object in leaving Daicho was twofold—viz., to discover and trade for beasts of burden with the Rendile, and to find a road to the north suited for the whole expedition. I had procured a guide here who promised to lead us to the Wandorobo, and who knew the whereabouts of the Rendile. We started with thirty-nine donkeys carrying seventy-two days' food; but these soon died of the same plague which had destroyed our beasts here in April and May. Up to the date of this letter I have lost one hundred and fifty donkeys, besides fifteen camels, since leaving the coast. After some hard marches we reached Mount Lolokwui. This mountain is called Walke on Lieut. von Höhnel's former map. It is at least 6000 feet above sea-level, and is of peculiar construction. It is a narrow plateau, highest at its southern end where its front is sheer rock till its base. It slopes gradually to the north, and is, say, 5 miles long by $2\frac{1}{2}$ miles broad. Some 6 miles north-west of Lolokwui towers Gerguess, called Ngaroni on all Lieut. von Höhnel's former maps. Gerguess is 10,000 feet above sea-level. Both these mountains are inhabited by Wandorobo, who subsist almost entirely on honey and do not wander. From Gerguess to Mount Nyiro, the General Mathew's range stretches in a continuous chain containing the high mountains Lengiyu, Maloni, and Lasuran. This range has very little water, and is said to be inhabited by only a few honey-eating Wandorobo.

We were forced to wait ten days at Lolokwui for a guide. At the end of that time we procured a Burkeneji, or native of Samburu land, who had left his people and joined the Wandorobo. He told us that we should find the Rendile in the neighbourhood of a spring called Seran. He promised us long waterless marches, and the next few days proved his promise correct. The first water from Lolokwui is Lokolie, a dry river-bed where very bad water may be got by digging. This is nearly 25 miles due east from Lolokwui. Two marches from Lokolie, say, 18 miles, in a south-south-east (more pro-

bably north-north-east) direction, is Seran, a large spring. Our guide was disappointed in not finding Wandorobo at Seran, and said he could not lead us to the Rendile as he was personally ignorant of their whereabouts, and had trusted to getting the required information from his brethren at Seran. There was nothing to be done but look for ourselves, so I took ten men and plunged into the desert. My men all carried water. I marched all night—the moon was full—and at noon next day saw camels feeding some 2 miles away near dum palms. These trees meant water, and we soon reached a dry river-bed which furnished us with good water after digging 3 feet. I at once left my men, and taking the guide and an interpreter pushed rapidly on to where I had seen the camels. I came upon some hundred natives in a shady spot; they at once set up a war-cry and put their arrows to their bows. These were Rendile, and their excitement caused by their taking us for Borana. I soon lulled their suspicions, and they became very friendly. I lived for three days in their neighbourhood with five men, having sent the rest back to Seran for my caravan. When that arrived I endeavoured to trade for camels and donkeys. I was able, after three days' hard work, to purchase ten good donkeys at exorbitant prices, and then trade stopped. I reached the Rendile on June 30th, and we left on July 7th. During that time I gathered what information I could, which I now give you, together with the impressions they made on me.

The Rendile are physically a fine race; tall and well made, reddish in colour. In appearance they greatly resemble the finest type of Somal. What deviations from this type are exhibited are, in my opinion, caused by intermarriage with the Burkeneji or Samburu people. They have, however, no traditions which connect them in any way with the Somal race. I venture to think that they may be a Somal tribe separated centuries ago from their brethren. In support of this theory is the tale, current among the Somal, of a lost tribe. Their language is nearly similar to the Somal; many words are exactly the same. My Somali could make themselves understood and could understand much of the Rendile talk. In addition to this, their utensils and camel harness are exactly the same; their life with their herds and flocks identical; their weapons, though of much inferior workmanship, are of the same class, and their character is strikingly similar. My Somali said they were certainly of Somali extraction. My Galla interpreter (a pure Galla) said they used no Galla words. I, however, heard them use the Galla word of welcome, "nag'a." The Rendile men wear either American sheeting or well-tanned goat-skins. The women wear untanned skins, and about their waist a curious covering made of many rope ends, 14 or 15 inches long, fastened to a belt. Their hair is worn something in the fashion of the crest of an ancient helmet, and stiffened with grease. The tribe is marked by two customs which are neither of them practised by the Somal. Both sexes cut out the two lower front

teeth (as do both Masai and Burkeneji), and they cut the navels of all males at the age of five years. This operation leaves a small round hole whose edges are flush with the belly. The Rendile consider this the distinguishing mark of their tribe, but admit that the Marle, living at the north end of Lake Stephanie, have the same practice. (These people may be settled Rendile like those in Reshiatt.) I noticed a peculiarity of their eyes which may be worth noting. Nearly all the Rendile I saw had distinct blue or light grey rings around the pupils of their eyes. I have noticed this also in a few Burkeneji. They circumcise, in the manner of the Masai, and cut the clitoris of all females before marriage. My impression of their character is that they are far more intelligent than the Masai, but are, like that race, truculent, fierce and difficult to deal with. This behaviour may have been caused by the small size of my caravan. I give you the following information as it fell from the lips of a Rendile. It must be taken with great caution. These people believe that God first made two Rendile and then two camels; from these sprang the race and their camels. Their native place is Nado or Gwehe, situated near Lysammis,* which lies south-west from Marsabit.

All males are circumcised on reaching the age of puberty, and have their two lower front teeth cut out when they get their second set. The females lose their two lower front teeth and are subjected to excision at the time of their marriage. Polygamy is practised on a small scale—a rich man may have three wives. The marriage is by purchase; a wife costing seven female goats and thirteen camels. The funeral ceremony is as follows: The corpse is buried in a sitting position, after being shaved. The grave is deep and piled high with stones. A spear is fixed in the grave. The near relations shave their heads and then kill a camel on the grave, which they eat there in company with their friends. All inhabitants of the village of the deceased go in mourning for one month. This is done by removing all ornaments or covering them with skins. The property descends to next of kin. Primogeniture is recognised. When the month of mourning is passed the heir gives to each of his relations one camel. Adultery is unpunished; but immoral girls are driven from their village and their offspring slain. A murderer becomes an outcast and his property is confiscated. Theft is punished by a fine of three times the value of stolen property. The chief food is the flesh of camels, goats and sheep and milk. They also eat the fruit of the dum palm and the flesh of giraffe and antelope, which they hunt from horseback. No other game is eaten.

Each village has a chief who gives his name to the village. He is elected. They never elect a rich or powerful man but some poor peasant

* Lesamis of the Royal Geographical Society's map of Equatorial Africa, 1883.

fellow. He holds his office for life. The election is as follows. A mass meeting of the village is held and the object of their choice presented with a sheep. If he accepts it, it is a sign that he accepts office. They have two medicine men, who are consulted before the taking of any important step.

The number of strings of beads or pieces of wire worn about the neck or as rings on the fingers show the number of men the wearer has slain in battle. They mutilate their victims (a Galla custom); the chief of their village rewards them with a goat for each trophy, and sprinkles them with milk. They have Masai and Burkeneji as slaves. All Burkeneji, who were not ruined by the cattle plague a few years ago, have joined the Rendile and live with them as their brothers. There is also a village of Marle among them. They say the few Burkeneji who did not join them have sold even their wives for food, and now wander from place to place stealing and killing game, and are called Dthombon. The Rendile say they have twenty villages, that they are all encamped in this neighbourhood, and that they call this place Kome. I had no means of ascertaining their numbers. But I think they must exceed fifteen thousand. I saw some four thousand camels being driven home from pasture. These were said to belong to one village. If this is true, and can be taken as the average wealth of the village, then the tribe must possess more than fifty thousand camels. A rich man owns from four hundred to five hundred camels. The tribe certainly possess several hundreds of thousands of sheep and goats, many thousand donkeys, some hundred cattle and a few horses bought from the Borana. I never saw a Rendile village, but was told that when all were camped in a line they would extend for four hours—roughly 8 miles.

The Rendile have no idea whatever about trade. They wish for heavy American sheeting, but want it for nothing. Until we reached them, they had never even heard of Europeans. Some years ago a Swahili expedition, two hundred and fifty strong, fled after a few hours' intercourse with them. Not long ago some Barawa traders sold them the cloth which they now have. I advise no expedition to visit the Rendile unless carefully led and prepared to fight if occasion arises.

They did not tell me much about their past; but I managed to elicit the following information concerning their wanderings of late years. Some twenty years ago, they inhabited the plain south of Lorian Swamp, called Kirimar. The repeated raids made by Somali drove them across the Guaso Nyiro River. They then wandered from place to place, reaching Reshiatt, Marle, and Borana. Some five years ago they were encamped at Marsabit; but the Elgume made a successful inroad and they then left. Now they say they will stay where they are. Recently they defeated a large force of Ogaden Somal (Rer Abdula tribe) and slew their chief Abd Ibrahim. They

are at peace with no tribes but the Marle north of Stephanie Lake and the Embe on the Jambeni range. They inquired anxiously as to the whereabouts of the Leikipia Masai, and seemed relieved when told they had vanished from Leikipia. I think that it is not improbable that in the near future the Rendile, harassed by Somali raids, may occupy the magnificent pasture-land left vacant by the Masai.

We left Kome on July 7th and reached Seran on the same day. Lieut. von Höhnel went to Lengayer, some 18 miles north of Seran, to see whether or not a road led from there to Marsabit. His guide said there was a road *via* Saraba and Lysammis; but as I learned there was no road from Marsabit to the north in this season we did not follow this route. I returned to Daicho in pursuit of runaways, and Lieut. von Höhnel pushed on to find Wandorobo to act as guides. I met him at Lolokwui. During my absence he had reached the base of the Leikipia plateau and had found Wandorobo. He had also discovered a river, hitherto unknown, called the Sayer. This river is some 40 miles long and is nowhere navigable. It rises in a swamp called Kissima situated on the Leikipia plateau near the Loroghi range and some 25 miles from the southern extremity of that range. It flows for about 20 miles almost due south, and then bends its course to the east, eventually drying up between the mountains Lengiyu and Lasuran of the General Mathew's chain. We discovered that there is a road to Nyiro from Sayer, and it was while waiting for a guide to lead us thither that Lieut. von Höhnel was attacked and wounded by a rhinoceros. I at once returned to Daicho which we reached on the 18th inst.

In returning from Sayer I followed the Guaso Nyiro and discovered that it receives two streams: one called the Ngare Ndare, flowing from Kenia and following the eastern base of the Donyo Lol Deiko range till it reaches the Guaso Nyiro. The other is called Isiolo, and flows from between Janyai and Msa'ara on the Jambeni. Neither of them are considerable streams. Now the Guaso Nyiro's course and end are known, for there can be no doubt that the river ends in Lorian Swamp; though a small stream is said to flow out of the swamp to the eastward during the rains. The country lying to the north of the Guaso Nyiro is nearly a desert. It is entirely of gneiss formation. Game is plentiful about the water-holes, and here are many Wandorobo who live on game. These people are now numerous as they have been joined by many Masai Burkeneji since the death of their cattle. I got the following information concerning the dispersion of the Masai from a woman of that race. When their cattle first began to perish, the Masai who had lost theirs attacked those of their brethren who were more fortunate. Thus countless internecine wars sprang up which destroyed nearly all the fighting men in Leikipia. When they were in this weakened state, the Masai called

Leburego, who live to the north of Lake Naivasha at a place called Kinangop,* fell upon the Leikipia people and utterly destroyed them, killing two Laibons. One Laibon fled to the Jambeni range. Three others with their followers settled in Kithere near Kitu at the base of Mount Kenia. These are the remnants of the Leikipia Masai, once so numerous and powerful.

At present my affairs are in anything but a prosperous condition. The men I sent to the coast for donkeys, goods and porters have now been gone nearly four months. So I fear they may not come at all. I must send Lieut. von Höhnelt to the coast at once. When these men return I shall endeavour to push on to the north. If I can get enough donkeys I shall try and reach the Borana, and unless the difficulties appear insuperable I shall from there try to reach Berbera or Zeila. I have one hundred and twenty-five men and with seventy-five donkeys I think I have a fair chance of success.

I will write further particulars if opportunity occurs.

THE GREAT BARRIER REEF OF AUSTRALIA.

By HENRY O. FORBES.

THE great Barrier Reef of Australia was, as is well known, discovered on June 11th, 1770, by Captain Cook when, in navigating H.M.S. *Endeavour* along the east coast of Australia, his ship "struck and stuck fast."

"Immediately we hoisted out the boats," he records in his Journal, "and sounded round the Ship and found that we had got upon the south-east Edge of a reef of Coral Rocks."

It will be remembered that the vessel, rescued from her perilous position by the consummate skill of her commander, was safely guided into the Endeavour River and there repaired. Here Cook ascended a hill to obtain a view out to sea.

"At this time it was low water," he continues, "and I saw what gave me no small uneasiness, which were a Number of Sand-Banks and Shoals lying all along the Coast; the innermost lay about 3 or 4 miles from the Shore and the outermost extended off to Sea as far as I could see."

The coral-rocks and shoals thus for the first time viewed with unhappiness were the off-shore fields of whose wall-like boundary he had as yet no knowledge or idea. On the repair of his ship he again pushed northward in his eager desire to reach the East Indies by the strait he

* Kinangop is the plateau to the east of Naivasha.—Ed.

instinctively believed must separate New Wales (as he then called Australia) from New Guinea, but found himself still hampered and surrounded by reefs. At no great distance to the north-east, however, he discovered and brought up at Lizard Island. Here he again landed, and in the anxious hope of resolving the entanglement of shoals with which he was beset, he ascended, he tells us,

“the highest hill on the Island, where to my mortification I discovered a Reef of Rocks lying about 2-3 leagues without the Island extending in a line north-west and south-east farther than I could see, on which the sea broke very high. This, however, gave one great hopes that they were the outermost Shoals, as I did not doubt but what I should be able to get without them, for there appeared to be several breaks or Partitions in the Reef and Deep water between it and the islands.”

Cook's great hopes were fully justified two days later when he safely escaped into the open sea. He had thus discovered the rampart-like edge of the Barrier and the first of those narrow gate-ways of so much importance to vessels passing from the eastward, which never fail to strike with wonder the voyager passing through them from the boisterous sea outside into the placid water within.

“The moment we were out,” the Journal proceeds, “we had no ground with 100 fathoms of Line, and found a large Sea rowling in from the south-east. . . . A Reef such as one speaks of here is scarcely known in Europe. It is a wall of Coral Rock rising almost perpendicular out of the unfathomable Ocean always over-flown at high Water and generally 7 or 8 feet deep in places at Low water.”

Thus the main characters of this wonderful wall—more than 360 leagues in length, built up as he believed from the bottom and broken by passages along its outer margin—described by Cook more than one hundred and twenty years ago, were added to only in detail by subsequent surveyors. Flinders' survey in the *Investigator* but extended Cook's accurate work, which was yet further added to by King's and Blyth's observations. Still, till the date of Darwin's theory of the origin and formation of coral-reefs, no more exact explanation of the structure of the Australian Barrier was attempted than Cook had given. While Captain Blackwood, during the surveying voyage of H.M.S. *Fly* in 1842-6, fixed, with the better appliances of his time, the position and outline of its reefs and shoals with greater exactitude, the distinguished naturalist of his expedition, Mr. Beete Jukes, investigated the structure and general features of the reef and its builders, the result of his observations confirming, he believed, Mr. Darwin's views. After these explorers Captains Owen Stanley, Yule, Denham and Moore of the Royal Navy, with the officers of the *Paluma* on behalf of the Queensland Government, share together the credit of bringing our acquaintance of this vast structure to its present intimate state. With our growing knowledge of this and other reefs in different parts of the world, doubts have at length arisen among those who have personal acquaintance with these structures as

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to whether the beautiful, fascinating and long-accepted conception of Darwin is as widely applicable as it has been supposed to be, and at the present moment it is a hotly-disputed question. It ought to be remembered, however, that the universality of the subsidence theory as the explanation of the formation of coral-reefs, which is attributed to Darwin by some of his supporters, is wider than Mr. Darwin himself held or advocated.

Mr. Savile Kent has lately published a magnificent folio * exclusively devoted to the description from every aspect of the Great Barrier of Queensland, which the author calls "one of the wonders of the universe." Without invidiously comparing the natural phenomena of neighbouring systems, we may at least admit that among the wonders of the one with which we are somewhat more acquainted, the Great Barrier is not the least. The book is adorned with a large number of photo-mezzotype illustrations of reef scenery, and with chromolithographs—unfortunately not the most successful—of the coral-polyps, of the anemones, fishes and other dwellers on the reef. No illustrations have ever before been produced either more excellent as pictures, or so vividly presenting to the imagination the general aspects of a coral-reef and the appearance of its builders and inhabitants, as do Mr. Kent's forty plates. His first chapter gives a general description of these plates which might have been more appropriately worked into the text of that dealing with "the structure and most probable origin of the Great Barrier Reef," which is the portion of the book most interesting from a geographical aspect, and that to some points of which we shall confine our remarks.

After exploring the reef Mr. Kent considers he has evidence to show that reefs are not invariably formed in localities where the conditions favour the growth of even reef-corals.

"The limit of distribution of typical reef-forming corals, and their abundant dis-integrated residue extends . . . considerably to the south of Lady Elliot Island [the southernmost coral reef], but without giving rise to a trace of reef-formation."

In Moreton Bay (about 27° S. lat.) "masses of the dead coralla of *Madrepora* are found *in situ*, covered by 2 or 3 feet of water at lowest tide, associated with living corals of other forms, forming coralla " over a hundred pounds in weight. These are "the most southern out-post representatives of the Great Barrier Reef," but they are reefless corals. Mr. Kent figures in one of his plates specimens of dense rock-conglomerate which he collected on the beach of Sweers Island in the Gulf of Carpentaria, the ingredients of which,

"correspond in every essential detail with those of Humptybong Beach in Moreton Bay; but in this latter instance they possess no elements of cohesion, and

* 'The Great Barrier Reef of Australia: its Products and Potentialities,' by W. Savile-Kent. W. H. Allen & Co., London [1893].

consequently cannot form a reef. The foregoing evidence is practically conclusive in support of the view put forward [on a previous page] . . . that coral-reefs are produced in the tropics, not with relation so much to the intrinsic reef-constructing properties of the specific coral polyps, but with relation to the rule that reef consolidation (or the amalgamation of coral *débris* [of the more fragile and relatively quick-growing species of *madrepora*] into a more or less solid coarse or fine concrete, or into a finer-grained compact limestone [of which the greater mass of all coral reefs is composed]) is associated only with the rapid evaporation of lime-saturated sea-water on intertropical, tidally exposed coral banks or beaches."

Mr. Kent, therefore, is of opinion that the temperature found only in intertropical regions, plus the alternate complete submersion during the rise of the tide, and the exposure to the atmosphere during its ebb, are the essential factors in reef growth. This cementing process during evaporation, he thinks, has not received sufficient prominence. He believes that the *Lophohelias* and *Dendrophyllias*, found at great depths in different parts of temperate seas, "would act with equal efficiency as reef-builders, if they were capable of translation to this higher tidally-affected plane." From this latter consideration especially, Mr. Kent has come to the conclusion that the Australian barrier must of necessity support the Darwinian hypothesis of the origin of barrier reefs by subsidence, and during a prolonged period of subsidence only. In the Albany Pass Mr. Kent admits that there is evidence of elevation ;

"but accepting this as proven . . . the amount raised, a foot or two only, would be as nothing compared with the latitude of movement in one direction, or the other that is required to account for the Barrier's mass."

Among other proofs of subsidence he instances the similarity of the fauna and flora of New Guinea to that of Northern Queensland, as indicating a former land connection—now vanished—between the two countries; and the fact of the principal gate-ways through the reef being opposite the mouths of the larger rivers. These gaps have been long held to indicate subsidence, because the corals have been prevented, it is believed, from growing in them by the discharge of fresh water into the sea, when what is now the barrier was a fringing reef, and consequently near the land.

Mr. Kent evidently believes—as Cook did—in the "barrier's mass" —"a stupendous coral-constructed fortification" rising from the abyss of the ocean. Now an attentive examination of the Admiralty chart shows that, if there is no coral rampart, as Mr. Kent asserts, south of Lady Elliot Island, there does extend a conspicuous bank (narrowing as it trends south to terminate off the coasts of Tasmania) whose steep, seaward edge, as indicated on the chart, is continuous with that of the Barrier Reef, and drops, just as *it* does opposite where it is faced with coral further north, suddenly into water of a depth of between 1000 and 2000 fathoms. For instance, the depth of water over this bank to the south of Lady Elliot Island increases gradually from the shore to

its sea-margin, at the approximate latitude of 28° S., from 10 to 49 fathoms; at $26^{\circ} 20'$ S. (nearly opposite Laguna Bay), from 20 to 58 fathoms; at 26° S. (in the vicinity of the south entrance of Great Sandy Strait), from 27 to 44 fathoms; opposite Curtis Channel it grades from 13 to 30 fathoms. Comparing these with the depths recorded over the reef to the north of Lady Elliot Island, we find at 23° S. (opposite Capricorn Channel), a gradual slope from 9 fathoms to 100 fathoms at the sea-edge of the Barrier; at $23^{\circ} 30'$ S. (off Port Clinton), the soundings on a line running nearly east begin at 29 and descend gradually to 53 fathoms, where it strikes Swain's Reef (or atoll); and beyond it to 84 fathoms where the drop into deep water is made; off Hillsborough Cape, the gradient is from 5 to 31 fathoms; in Halifax Bay (about $18^{\circ} 15'$ S.), from 10 to 30 fathoms. Off Cape Cleveland the following line of soundings is given entire because showing an irregularity: 18, 19, 23, 24, 27, 32, 19, 24, 25, (edge of barrier) 31, 39, 480 fathoms. Off Cape Flattery, where the reef is very narrow, an even depth of about 19 fathoms occurs. It will be seen, therefore, that the general depths over the coral-area from Lady Elliot Island north to Cape Flattery, exhibit no very marked divergence from those over the non-coral bank south of the latitude of reef-building corals, except that in the southern region there is a slightly greater depth along the shore, with a general increase as the bank trends to the south of 23° S. lat. North of Cape Flattery, however, there is an elevation at different places seaward to the under-water margin of the Barrier, as in front of the Second Three-mile Opening, where the in-shore depth is 17, and over the edge of the Barrier 12 fathoms. Opposite Cape York, the soundings, however, descend slowly seaward from 10 to 20 fathoms. The soundings outside the bank and the barrier-reef indicate that both rise from a plateau of much the same level. At the last meeting of the British Association a committee was appointed to consider a project for investigating the structure of a coral-reef by boring and sounding. It will be interesting to discover, should borings be made on the Barrier, whether there is more than a comparatively thin crust of coral-rock, encasing a bank similar to that extending south of Lady Elliot Island, instead of as has been so generally supposed, "a stupendous coral-constructed fortification" rising from the depths of the ocean. What grounds are there for the opinion that the Barrier has been built up from depths greater than 200-300 feet? Are there any ascertained data for believing that just at that latitude where the water of the sea attains the temperature suitable for the healthy growth of reef-building corals, the character of the southern bank changes; that it terminates there more or less abruptly; and that a rampart north of that point has been raised up by coral agency to about the same level as the southern bank?

A transverse section of the reef is reproduced (with acknowledgments to Jukes) by Mr. Kent as headpiece to one of his chapters, which conveys,

according to our interpretation of the Admiralty chart, an erroneous idea of the general aspect of the reef-flat. The line of section given shows near the coast-line a comparatively deep passage, generally designated the lagoon-channel, rising into islands with water-ways between them, and these separated by a channel—like the other two shallower than the lagoon-channel—from the higher outer edge of the steep barrier-wall descending into the deep sea. This view of a deeper lagoon-channel which separates the Barrier from the shore has been generally accepted as an accurate description of the facts. If, however, the soundings in the Admiralty chart—from which are taken those given above—be carefully examined, it will be observed, if we have read them aright, that there is a gradual slope from the land—well marked at all events from far to the south of Lady Elliot Island to as far north as Cape Flattery (S. lat. 15°)—all the way to the Barrier edge; and that within the coral area the pseudo-atolls (such as Swain's Reef), the various cays, and the more or less extensive reefs and shoals, rise from the inclined floor of this slope to the various heights they attain. North of Cape Flattery, however, as noted above, we enter a very complicated region in which the gradient in many places *ascends* seaward and the deeper water is nearer to the shore than to the reef. In this region we have indications of elevation, as Mr. Kent points out.

In regard to Mr. Kent's views that the formation of reef-rock occurs exclusively within the tide marks of the tropics, there will be found in the *Quarterly Journal* of the Geological Society for 1891, a very important paper by Mr. Jukes Brown and Professor Harrison on the Geology of Barbadoes, which seems to have escaped the author's notice. There it is shown that the elevated reefs of that island (as well as those of Cuba), which rest on a radiolarian and, therefore, a true oceanic deposit, and are not less consolidated than coral reefs elsewhere, have been formed "during successive periods of rest, or of very slow upheaval following shorter periods of more rapid upheaval." They present not the slightest evidence of subsidence.

Again with reference to the large openings by which vessels find entrance and exit across the Barrier-edge, can the explanation that they are due to the fresh-water discharge from rivers—now too remote to influence the Barrier-edge—when the Barrier was a fringing reef, be accepted as conclusive, when there can be detected across the reef-flat no corresponding break or channel stretching from the gap towards the present river-mouth, to whose discharge Mr. Kent assigns the gap, as effect and cause? The river still exists, but its fresh-water discharge has produced no appreciable effect on the shoreward reefs. If we follow a line from the mouth of the Burdekin River to Flinders' Passage we find that the soundings graduate thus:—6, 10, 16, 10 (no bottom), 25, 38 (in the passage): 45, 250 (no bottom) fathoms. The depth in the Barrier opening of 38 fathoms, it will be noted, is still not yet beyond

that suitable for the growth of reef-making corals, especially in a situation so favourable for food and oxygenation of the water. The gap must have been covered, if subsidence has been in progress, for a long period after the river-discharge ceased to affect it, by that depth of water which is held to be favourable to the most luxuriant growth of coral polyps. It is remarkable also that opposite both the Second Three-mile Opening and Cook's Passage there are no rivers to whose discharge these gaps can be assigned; besides, north of the former, there are numerous openings, with no rivers entering the sea near them.

The greater part of the remainder of Mr. Kent's volume deals with the "products and potentialities" of the Barrier Reef. He gives an account of the pearl and pearl-shell fisheries, whose headquarters are at Thursday Island near to the harvest fields in Torres Straits. The fishery yielded £50,000 in 1888, the best quality of shell bringing £177 per ton. Several new species of *bêche-de-mer* are described, while the sorts best known to commerce have been scientifically identified and some of them figured. The most prized sort, locally known as Teat-fish (*Holothuria mammifera*), is valued at from £140 to £150 per ton. The annual value of this fishery is about £23,000. The oyster-fishery has never yet exceeded £8000 a year in value. A long chapter is devoted to the different "food and fancy fishes," and many suggestions are offered as to the further development of these potentialities of this "stupendous" reef, of which the Queenslanders are naturally proud of possessing the monopoly. The publishers have spared nothing in paper, printing and sumptuous binding to make this volume worthy of the unsurpassed beauty of the reef-illustrations it contains.

THE MONTHLY RECORD.

THE SOCIETY.

A Gold Medal to the President.—Through the Peruvian Minister in London, the Government of Peru has presented a gold medal to the President of the Society, Mr. Clements R. Markham, C.B., accompanied by the following letter from the Foreign Minister of the Republic:—

"By the legislative Resolution of October 25th, 1892, promulgated on November 10th of the same year, the Honourable Congress of Peru determined to grant to you a medal of gold, as a recognition of the value of various works which you have written and published respecting the Republic. I have the great satisfaction of transmitting to you, through our Legation in Great Britain, and in obedience to the mandate of our Honourable Legislators, the well-merited offering, given by them to the distinguished writer whose pen traced, with upright impartiality, the picture of one of the most mournful periods of Peru. Receive, with the said offering, the sincere wishes of the Supreme Government for your personal happiness, together

with the protestations of high consideration and distinguished esteem with which I subscribe myself your attentive and sincere servant."

On one side of the medal are the arms of Peru and round them the words: "El Congreso del Peru. Lima, 1892;" on the reverse, "Á Clemente R. Markham," and round it, "Por sus trabajos históricos." The medal has some merit as a work of art, especially as coming from the mint at Lima.

Mr. Mackinder's Lectures on Geography and History.—The detailed programme of these lectures was given in our last number. As the place of meeting this session is likely to hold a very limited number, early application should be made for tickets.

Christmas Lectures to Young People.—The Christmas lectures to young people will be given this session, at the request of the Council, by Mr. Douglas W. Freshfield, in the hall of the Royal Medical Society, 20, Hanover Square. The subject selected by Mr. Freshfield, who is now the President of the Alpine Club, is "Mountains"; and the lectures will be fully illustrated by the oxy-hydrogen lantern. Further details will be found on the slip inside the wrapper.

The "Worcester" and "Conway" Examinations in Geography.—In 1882 the Council of the Royal Geographical Society resolved, with the consent of the Managing Committees of the *Worcester* and *Conway*, to hold examinations in geography on board each of those ships, and to give a prize, consisting of an atlas, to the cadet who gained the greatest number of marks. These examinations have been conducted annually by Mr. Coles, the Society's Map Curator. In 1885 Mr. Clements R. Markham, who was at that time Secretary of the Society, in his report to the Council, stated that the results had been very satisfactory, and a resolution in favour of their continuance was passed. At a meeting of the Council, Nov. 13th, 1893, Mr. Clements R. Markham, the President, again reported favourably on the results of these examinations, and that they had aroused an interest in geography, both on board the *Worcester* and *Conway*, that was absolutely wanting before. In the *Worcester* this has especially been the case, Mr. Buck, the headmaster, having himself compiled and printed little class-books for the use of his pupils, on the geographical subjects which have been set for the year. Since 1883 the subjects have been:—1884, Colonies; 1885, Australasia; 1886, South America; 1887, India; 1888, Arctic Regions; 1889, Africa; 1890, Asia; 1891, Mediterranean and Red Sea; 1892, Malay Archipelago; 1893, Arctic Regions (again); 1894, South America (again). The examination papers consist of fifteen questions, set by Mr. Coles. Maps are always required, and great pains have been taken by the masters in teaching to draw by eye, with excellent results. In order to stimulate the interest of the cadets, Mr. Markham has been in the habit of giving two lectures

annually on board the *Worcester*, and an occasional lecture on board the *Conway*. As the cadets are thoroughly trained in navigation, nautical astronomy, magnetism, and meteorology, there is every reason to expect that many of them will advance the objects of the Society in after years. In consequence of the President's favourable report, the Council have decided to continue these examinations, and Mr. Coles has been re-appointed examiner. Hitherto the best geographer only, in each ship, has received a prize from the Society, but a second prize, consisting of a telescope, will now be given in addition to the atlas, and the President has intimated his intention of presenting a third prize in each ship.

EUROPE.

Recent Travels in the Caucasus.—In recent numbers of *Globus* Dr. von Seidlitz communicates an account of M. Pastuchoff's visit to the mountain district described by Mr. Baker (See *Proceedings* XIII. (1891), p. 313) in south-eastern Daghestan. The traveller spent several days at Kurush (8175 feet), which is believed to be the highest village in the Caucasus. It numbers over four thousand seven hundred and fifty inhabitants, whose wealth consists in herds and flocks. Its elevation did not altogether protect it from cholera, which was fatal in thirty-six cases in 1892, but it suffered far less severely than the neighbouring villages at half its height. There are said to be several centenarians among its inhabitants, and the average duration of life is very high. This is not generally found to be the case in mountain regions, at any rate not where the human habitations are in valleys or positions cut off from sunshine during part of the year. Kurush appears to lie on an open upland. M. Pastuchoff ascended Shah Dagh (13,962 feet), a neighbour summit of Basardjusti, which supports two considerable glaciers, fed by snowfields lying on the summit of a wall of basaltic cliffs. The picturesque aspect of this mountain has been dwelt on by Dr. Radde and Mr. Baker. It had been visited by Russian surveyors, whose cairn was found on the top. M. Pastuchoff discovered a small lake, 100 yards long, not marked on the maps, near one of the glaciers. Possibly like many Alpine tarns in similar situations, e.g., the Mairjelen See and the Ruitor Lake it is liable to be emptied by the escape of its waters by sub-glacial channels. On the whole, the opinion pronounced by Dr. Radde that this extreme eastern group of the Caucasus is of interest to the geologist and the botanist rather than to the lover of scenery or the mountain climber is fully confirmed by subsequent travellers.

Bathymetrical Survey of the English Lakes.—In continuation of the survey carried on by Dr. Mill and Mr. Heawood during the past summer, some of the smaller lakes were sounded at the end of October by Mr. E. Heawood, assisted by Mr. R. Shields. Ennerdale Water was first visited, and though operations were somewhat impeded by squally weather, fairly complete results were in the end obtained. This lake consists of a broad, shallow basin at the lower end, and an extremely regular deep trough occupying the upper two-thirds, the axes of the two being slightly inclined to each other. Near the junction of the two occurs the only island, a mere heap of stones, at which the deep water abruptly terminates. Crummock Water and Buttermere were next surveyed. In the former lake the phenomenon of steep shores and a nearly level bottom is particularly marked, for though the shores show much irregularity, at only one point does the 100-foot contour diverge to any great extent from the coast, the greatest depth obtained

being about 140 feet. This occurs in the lower (and also broader) half of the lake, a fact which is brought out still more strongly when we regard the upper lake of Buttermere as properly forming part of the same basin. The latter lake nowhere reaches a depth of 100 feet, the maximum, however, occurring quite at the upper end, where the two main feeders enter.

ASIA.

Mr. Littledale's Journey in Central Asia.—Mr. St. George Littledale has just returned to England from his journey through Central Asia. The following letter from Mr. Littledale, dated Peking, October 1st, 1893, will give some idea of what he has done:—We arrived here a couple of days ago safe, for if the Chinese carts had nearly thumped us to death, the inns, on the other hand, had made us very much alive. I wrote from Kurla (See *Geographical Journal*, November, p. 458). Just as we were starting, we found the Tarim and followed it down to the Lob. We then kept on the north side of the Altyn Tag, where I shot four wild camels. Here the first mortalities occurred amongst our live stock. Owing to treason and treachery in camp, we had to go to Saitu, where the Chinese Amban gave us a lot of trouble; and our own men, fearing to face another Altyn Tag, with tales of brigands thrown in, absolutely declined to go any further. We had a hard fight, but we gained our point, and kept along the north side of what Prjevalsky calls the Humboldt Range. The maps here are entirely wrong, and the Ritter Range, as put in some maps, does not exist. There is a range running in the same direction as the Humboldt, but a few miles south of it, with one, if not two peaks exceeding 20,000 feet, with fine snow-fields. We then crossed two or three passes, and reached the Bukhain Gol, and made our way to Koko Nor, Sining, and Lan-chow-fu. I made a map of the road as I went along, and took the Pole star for latitude. It being my first attempt at map-making, I hope it will not be viewed with too critical an eye; but, at least, it will have one merit of being strictly honest. We went down the Hoang-ho on a raft. On the upper part there are some gorges which are rather risky, but I think it is the best way of reaching the coast. We left the river where it begins its big bend to the south, and came in carts to Peking, where we arrived in rags and tatters. We had great trouble with our guides; they were utterly faithless, and their only object was to lead the expedition into trouble, hoping we should abandon our baggage, and then they would return and loot it. One time, when men and horses were *in extremis* through want of water, we caught our precious guides going secretly to a spring during the night, whose existence they had absolutely denied. The last part of the road we could not get any guides, and we made our own way. The horses were in a very bad condition when they reached Lan-chow-fu; nearly half had died on the road. The donkeys fared much better, but still their history was a "tale of woe."

The late Lieutenant G. C. Davison.—Readers of Captain Younghusband's narrative of his journeys on the Pamirs will remember his allusions (*Proceedings*, R.G.S., 1892, p. 229) to his companion, Lieutenant G. C. Davison, and will learn with regret of the death, in Astor, of that adventurous young officer. Captain Younghusband, now political officer in Chitral, writes as follows of his late companion:—"I have just heard of the sad death of poor Davison, who, you may remember, was my companion on the Pamirs in 1891. He is a great loss indeed, for I never knew a man with more solid pluck and perseverance. He positively did not know what a difficulty was. When I first saw him in Kashgar he had done one of the most extraordinary pieces of travelling I had ever heard of. But he was so innocent of having done anything out of the way, or gone through anything that might justly be called difficulties

that he only thought and spoke of what he called his 'failure' in not having reached the Mustagh Pass, which was the goal he had before him. And all the time he had performed almost the identical journey for which Hayward was awarded the Gold Medal of our Society; and though, of course, Davison could not compare with Hayward as a geographer, I am not at all sure that he had not to surmount as many and as great difficulties as that hardy and plucky explorer. For Davison had no time to make preparations or think about the best time for carrying out his intended journey. While stationed at Agra he suddenly found himself offered two months' leave, and he immediately started off to attack the Mustagh Pass. He had no time to get a proper map of the route he should have to follow; but he pushed on as hard as he could through Kashmir and Ladakh towards the Karakoram Pass, from which point he imagined that he would merely have to 'turn to the left' and he would see a long distinct range of snow mountains, with a gap in them which would be the Mustagh Pass. He had little idea of the pathless labyrinth of mountain that actually shut in this remote pass! Crossing his first pass between Kashmir and Ladakh he became snow-blind, and had to be carried across on a bed. At his second—beyond Leh—the Ladakis whom he had engaged struck work, and said the pass would not be open for ponies for weeks yet. But Davison, by more severe than diplomatic measures, managed to get both them and his ponies over. Then came the Karakoram Pass; and the only way to cross this in the month of May, when the snow on it was all soft and yielding, was by tediously laying down felts and blankets in front of the ponies for them to walk over, picking them up as they had passed over them, and again laying them down in front—and so on for mile upon mile. Those who have themselves had experience of trudging through soft snow at an elevation of 18,000 feet, can best realise what this must have been to a man who had come straight up from the plains of India, and who had never been on a snow mountain in his life before. Now came the crisis of the journey. Davison had no map to show him the way to the Mustagh Pass, and, still worse, he had no guide. He had not been able to find a single man who had been a yard off the beaten track to Yarkand; but he had a rough map which gave him the relative position of the Mustagh and Karakoram Passes; so he plotted those two points on a piece of paper, and then started a prismatic compass survey, which in future he plotted out regularly on the same piece of paper, and by these means he hoped to be able to make out his way to the goal he had before him. With this intention he followed down the stream which flows from the Karakoram Pass past Aklagh. But the further he advanced the more rugged and impracticable became the mountains which bounded in the valley in the direction of the Mustagh Pass. He could see nothing of that great snowy range which he had expected to find standing up conspicuous and distinct from all the rest, and with the Mustagh Pass forming a landmark which he could make out from any distance, and steer for without difficulty. Instead of this he found himself shut in by rocky precipitous mountains, which forbade him following any other route but that which led down the valley he was in. He had lost three ponies on the Karakoram Pass. Two of his men now deserted with most of his supplies. But Davison still pushed on in spite of the danger of doing so with his scanty stock of food till—very fortunately for him—he was pulled up on account of the stream having increased so much in depth that it had become unfordable. This was at Khoja Mohammed Gorge, about two marches below Chiragh Saldi. Davison tried to swim the river with a rope tied round his waist, but the stream was too strong for him. Finding it impossible to get down the valley at the time of year when the snows were melting and the rivers in flood, he reluctantly retraced his steps for a short distance and then turned north, crossed a pass (the Koka-long, if I remember rightly) which had not previously

been explored, and then finding ahead of him nothing but snow-fields and impracticable-looking mountains in the direction of Yarkand, he made his way back again to the valley of the Yarkand (Raskam) River, with the intention of making for Shahidula, the nearest point at which he could hope to get supplies. He was now at the last extremity; he had but one man, one pony, and supplies for a day or two. He then fell sick. He could not move. And in this plight he had to send away his sole remaining servant to find Shahidula, and bring some supplies and help from that place. As it turned out, he was nearer Shahidula than he thought. His servant reached there the same day, and on the following returned with food and a pony. Davison's difficulties were then over, and after resting a few days at Shahidula to regain his strength, he made his way rapidly to Kashgar. The ground that Davison covered had been previously explored by both Russians and English, but Davison had not the benefit of their experience; and the remarkable thing about his journey was that he accomplished it without any previous experience either of mountaineering or of ordinary travelling. A young subaltern, of only two years' service, he set out from the plains of Punjab, and by sheer pluck found his way, in the worst season of the year for travelling, to the plains of Turkistan, and this is a feat of which any one might feel proud." Lieutenant Davison belonged to the Prince of Wales' Leinster Regiment, the date of his first commission being 1888.

Statistics of Transcaucasia.—The Transcaucasian Statistical Committee has just published at Tiflis a "Summary of Statistical Information relative to the Population of Transcaucasia, abstracted from the Lists of Families made in 1886. It is an abstract of the rich material which has been collected in the second half of 1886, when lists of all families in all the villages and towns of Transcaucasia were made for administrative purposes. The original lists contain, for each village, the number of houses, the number of male and female inhabitants, their nationalities, religion and social position; the age, language spoken, education and occupation of all male inhabitants; and the properties owned by the villages and towns. Several volumes of the Statistical *Vremennik* of the Caucasus have already been published, containing the statistics of separate districts of Caucasia; but in view of more rapidly utilising the above-mentioned lists, the present Summary is brought out. Its geographical value has been enhanced by a thorough revision of the names of all villages which were often incorrectly given both on maps and in official publications. An alphabetical index having been added to the present volume, it thus represents a quite reliable gazetteer of Transcaucasia, which comprises the governments of Tiflis, Kutais, Erivan, Elisabethpol and Baku, the two provinces (*oblasts*) Daghestan and Kars, and the two independent military districts, Zakataly and Chernomorsk. The total population of Transcaucasia was, in 1886, 4,702,898 (489,866 in towns, military not included), who are settled in 9942 villages.

AFRICA.

Origin of the name Bangweolo: Progress in British Central Africa.—Mr. Alfred Sharpe writes as follows from Blantyre, British Central Africa, August 23rd, 1893, with reference to the name of Lake Bangweolo:—"A word which has always puzzled me much has been Bangweolo. There is nothing African at all about it, and I have never yet found any native north or west of Bangweolo Lake who knew anything of the name. It was only the other day in pronouncing it over and over again in all sorts of ways that I suddenly dropped on what I feel sure is the solution of Dr. Livingstone's name for that lake. South and south-west of Tanganyika, all lakes are called Mweru or Mwero, or Mwelu or Mwelo. 'Pa' means

'at.' Kazembes Lake is frequently spoken of as 'Pamwelo'—'at the lake.' I think that the natives have spoken to Dr. Livingstone of the Awisa Lake as *Pamwelo*, which, if it is true, will be found to sound very like Ba-ngwelo. The natives on the Luapula, five days west of 'Bangweolo,' always speak of it as the Mweru or Mwelu or Mwelo." Mr. Sharpe adds: "I have been rather expecting to get away in the direction of Bangweolo and the Luapula this year, but am afraid it is not very likely now—we are very busy here and work is increasing always—things are progressing and planting operations are taking great strides, and the prospects of the country look really promising."

The Somali Coast Protectorate.—In his Foreign Office report on the trade and commerce of the Somali Coast Protectorate for 1891–92 (Annual Series, 1893, No 1208), recently issued, Lieut.-Col. Stace gives some notes on the country and people which are of interest. The Somali Coast Protectorate extends from Lahadu (or Lewádu), which is half-way between Jibuti and Zaila to the 49th parallel of east longitude. The nature of the country is for the most part mountainous. On the east the mountains come close down to the sea. Towards Berbera and Bulhar they recede, leaving a maritime plain of varying breadth from a few miles to 30 or 40. Still further west to the south of Zaila the mountains are more distant, and the Zaila-Harrar road gradually ascends across the plain until the high lands are met with about Gildessa. The great Golis range, about 6000 feet high at the loftiest parts, runs for many miles parallel to the coast to the south of Berbera, and at a distance of between 40 and 50 miles. There are no rivers, properly speaking, but water-courses are numerous. The plains are generally thinly covered with scrub, jungle and babul bushes; along the water-courses and for some distance on either side this becomes real jungle, with frequently trees of considerable size. On the coast and in the maritime plain the seasons may be divided into the "hot weather" and the "cold weather"; from October or November the east or north-east wind is most prevalent; after April, for two or three months, the hot wind blows strongly from the south-west. Rain falls generally during the cold weather, but the amount is small and insufficient for cultivation. The climate on the whole is considered very healthy. The whole of the Protectorate is inhabited by various Somali tribes, split up into numerous sub-tribes and clans. The tribes are nomadic. Within the Protectorate there are only three or four small villages in the interior, and a few settlements of mullahs or priests. Cultivation is practically unknown, except that of jowari (*Sorghum holcus*), on a very small scale at the above places. The people are very averse to manual labour, but make good boatmen and sailors. They are described as cheerful, volatile, inclined to pilfer, idle to a degree, not wanting in courage, and of a very independent bearing. They are very intelligent, and make good linguists. There appears to be no means of forming an estimate of the population of the Protectorate. Berbera is supposed to contain about 30,000 people during the principal trading season, Bulhar perhaps 5000, and Zaila 6000.

Agricultural Condition of Algeria.—Sir R. L. Playfair's Report on the Agriculture of Algeria for the years 1891–92 (Foreign Office, 1893, Annual Series, No. 1196) contains much interesting matter. At the end of 1891 the agricultural population of Algeria consisted of 3,413,122 persons—viz., 198,975 Europeans, and 3,214,147 natives. Although viticulture has greatly extended of late, cereals remain the chief production of the country. Roughly the amount of land under cultivation with cereals is 7,000,000 acres. The total extent of land under cultivation with vines in the three departments of Algeria—viz., Algiers, Oran, and Constantine—during 1891 was about 273,600 acres. Agricultural prosperity in Algeria is invariably in proportion to the amount of rainfall, and especially to the

quantity which falls at the opening of the season. In 1890, 17.50 inches fell in December (the station where the record was kept is not mentioned), so that when the land was sown it was thoroughly saturated, and the harvest of 1891 was excellent. In December 1891 there was only 0.60 inch, with the result of a bad harvest in 1892. Owing to the conditions of rainfall it is feared that the harvest of 1893 will prove a complete failure. In many parts of Algeria the soil seems to be well adapted for the cultivation of fruit. In places situated at 1500 or 2000 feet above the sea, almost all the fruits of Europe might be cultivated with success. The forests of Algeria are of great importance and value to the country. The climate, the water-supply, the whole prosperity of the colony, depend on the preservation of what remains, and replanting what has been destroyed. The total area covered with forest, including much that is mere brush-wood, is 7,614,230 acres. Of the products of these forests, the only tree of any considerable economic value is the cork oak, which is only found here, in the South of France, in Spain, Corsica, Sardinia, Portugal, Sicily, and Tunis, or in the Mediterranean region between 34° and 45° north latitude. In a country like Algeria, so entirely dependent on a precarious rainfall for prosperity, irrigation works are of great importance. The three chief irrigation works in the Department of Oran which have been lately visited by Sir Lambert Playfair, and of which he gives a short description in his report, are the barrage of the Cheurfas, near St. Denis du Sig; the barrage of Wed Fergug, which crosses the valley of the Habra below the confluence of that river with the Wed Fergug, 7 miles from the town of Perrégaux; and the barrage of the Jidonia, about 4½ miles from the village of St. Aimé.

AMERICA.

The Alaska Boundary Commission.—The reported disagreement between the respective Commissioners on the Canada-Alaska Boundary Survey must, there is reason to believe, be incorrect. Different views are held on each side as to the meaning of the treaty, but the present operations in the field are directed to the joint survey of the whole region of the "coast strip" where the differences are known to exist. No authoritative line of boundary is at present being marked on the ground. The Canadian parties have now returned to Ottawa for the winter. For mountain features they have employed the photographic method of survey perfected by Captain Deville (Surveyor-General), and notwithstanding the cloudy character of the atmosphere in the coast ranges, they have been very successful.

AUSTRALASIA AND POLYNESIA.

Australian Deserts.—Mr. Ernest Favenc sends a note on the future habitability of the Australian desert. He does not regard the desert as hopelessly unproductive territory, though he admits that it is only by the continuance of the artesian water-supply across the continent that it can be reclaimed. The characteristic growth of the desert land is the prickly grass known as spinifex, which, on the flats, plains and downs, is softer and not so uncompromisingly hostile as on the stony ridges. It is not because the soil is poor, but simply on account of the rainlessness of the climate that the spinifex is so universal; it is the only possible form of vegetation in a country where one rainless year follows another. Where there is any moisture at all a good growth of grass at once takes place. An interesting question is whether the filling up of the shallow lake beds, blind creeks and clay pans with water would have any permanent effect on the climate. If that vast mud-flat, misleadingly portrayed on maps as Lake Amadeus, were filled with water, would it not, even after it became salt, as it certainly would become, render at least the nights dewy and moist? The introduction of the date palm has

already been fairly successful. The western interior must not be regarded as permanently given over to spinifex and desolation. The soil is there, and with the introduction of water would at once teem with vegetation. There is no reason why the Australian desert should not be turned into a garden, like many places in the Sahara and in America, provided only the essential water-supply is obtainable from deep wells.

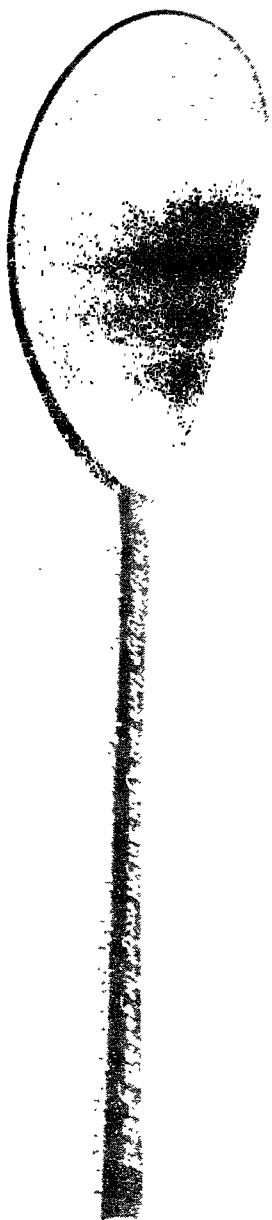
Marshall Islands.—In the October number of *Petermanns Mittheilungen*, P. Langhens, the compiler of the "Deutscher Kolonial Atlas," begins a series of short notes upon some parts of the German colonies for which he has in hand various information that could not be utilised in the atlas. The first note deals with the Jaluit Atoll, on which the station Jabor is situated. It belongs to the Jaluit Society, which has its stations on fifty-four other islands belonging to the Carolines, Marshall and Kingawill (or Gilbert) archipelagoes. Coco-nut plantations already cover 1380 acres on the islands Kili, Ujelang, Ligieb, and the island of Jaluit. Three small detail-maps of Jabor are given.

POLAR REGIONS.

Dr. Nansen's Arctic Expedition.—The last number of the *Izvestia* of the Russian Geographical Society, contains the following two letters exchanged between Dr. Nansen and Rear-Admiral Makaroff. The Russian admiral wrote to the Norwegian ambassador at St. Petersburg as follows:—"I have read with great interest the report you kindly forwarded to me of Dr. Nansen's communication, 'How can the North Polar Region be Crossed?' I agree with Dr. Nansen's scheme in one, the most essential point—namely, that if he trusts himself to the ice-drift he will be carried through regions not yet visited. Whether he will be carried across the Arctic Ocean, as Nansen supposes he will, or along a parallel as I believe—at any rate, his journey will enrich science with new geographical and meteorological data. Dr. Nansen must know that in one year or two after his departure there will be an anxiety about him, and the idea will be afloat that expeditions must be sent in search of the fearless traveller. I should think that in 1894 a good strong small-decked boat must be sent with provisions to Franz Josef Land. We cannot at present be certain that such a relief expedition will be sent out; but it would be desirable to agree beforehand on some spot on Franz Josef Land on which a signal might be erected in order to indicate to Nansen where he may find a boat and provisions. In order to facilitate the work of the searching expedition, Nansen ought to make it a rule to place signals along the route he will follow. Like the *Jeannette*, Nansen's ship may be carried past several islands. It would be most desirable that Nansen should leave on those islands some visible signals under which information as to the route covered, the state of the ship, and the ulterior schemes of the expedition may be found. A journey so adventurous as this will necessarily inspire other young and gallant explorers with the desire of going out to find Dr. Nansen, and it is necessary therefore that, before leaving, he agrees upon all means that might be helpful for searching parties." Dr. Nansen replied by the following letter:—"Permit me to express to you my hearty thanks for the keen interest you took in my expedition. I was extremely glad to read your letter to Ambassador Reuterskjöld, in which, so far as I understand, you agree with me as regards the currents and the state of ice in the Polar Ocean. As you justly remark, we may strike the shores of Franz Josef Land, or of some other lands situated further east. Wherever we shall be able to approach the coast, I propose to leave cairns in which records of the expedition will be placed, telling what has been done and what is proposed to be done. On the top of each cairn we shall put, if possible, a pole with some signal (probably a Norwegian flag)."

The State of the Kara Sea.—Mr. Ernest C. F. James, who accompanied the small fleet of vessels that sailed last summer for the Yenisei with rails for the Siberian railway, sends some interesting notes on the condition of the Kara Sea. Mr. James writes:—Any reports of a mishap to Nansen's ship must be without the slightest foundation. We have just returned from Golchika on the Yenisei River in Mr. Popham's s.s. yacht *Blencathra* (late *Pandora*, belonging to Sir Allen Young). We have thus crossed the Kara Sea twice this year. In going out we were only ten days behind Nansen. At the end of last year, when Dr. Nansen was staying with Mr. and Mrs. Popham at Littlecote, Mr. Popham offered to put his auxiliary s.s. yacht the *Blencathra* at Dr. Nansen's disposal to carry coal or any stores he might require as far as possible. Dr. Nansen did not avail himself of Mr. Popham's offer. Still Mr. Popham took 100 tons of coal for Nansen in case we came up with him. We arranged with Captain Wiggins to take the *Blencathra* as far as Golchika on the Yenisei, and to ascend that river in a steel light draft river yacht, which is now at the town of Yeniseisk with Captain Wiggins, 1500 miles up the Yenisei River. The Russian Government asked us to bring out rails for the Trans-Siberian Railway. We got a large iron steamer to carry the rails, and the Russians also sent two small river steamers, one a paddle, and also an iron sailing schooner to carry coal for their two steamers. These six vessels all crossed the Kara Sea, and arrived safely on the Yenisei. On July 25th, we, i.e. Mr. F. W. Leyborne Popham (owner), Mr. and Mrs. E. C. James, and Miss Peel, left Appledore, North Devon, in the auxiliary s.s. yacht *Blencathra*, 450 tons. On August 27th, after a pleasant passage, we arrived off Waigatz Island, and anchored in Pet Straits. We found three Russian vessels here, and a Russian man-of-war. An officer from the man-of-war came on board with a civil message from the admiral that Nansen had passed through ten days before all well. On August 29th we started at 5 A.M., and anchored at Khabarova, about 4 miles to east of where we lay. We (six vessels in all) started about 2 P.M., and got into the Kara Sea. The weather was clear and fine, and any floating ice met with presented no difficulty. On September 2nd we passed close to the island off Dixon's Haven, and proceeded up the Yenisei River. To show how calm it was in the Kara Sea, I may mention that our swing table was fixed all the way from Pet Straits. The prevailing winds were northerly and easterly, which probably cleared the ice away for Nansen. We arrived at Golchika on the Yenisei on September 3rd, and remained there till September 20th discharging rails, when we commenced our return voyage. The loose ice presented no difficulty, and on September 25th we anchored at Khabarova. We left on the 26th, and arrived at Arkhangel on September 30th. We left Arkhangel on October 12th, and arrived at Dundee on November 7th. I feel sure from what we saw in the Kara Sea that there was absolutely nothing to interfere with Nansen's voyage, and I am sure that Captain Wiggins, who is at Yeniseisk, will, on his return, confirm all I have said. This voyage is remarkable for two things. It is the first time that rails have been taken by sea to the centre of Siberia, and it is also the first time that ladies have ever crossed the Kara Sea. I trust their having done so will confirm the feasibility of the sea route to Siberia. I may state that Mr. F. J. Jackson came out as a passenger in the *Orestes*. He was landed at Khabarova on August 29th. When we returned, we called again at Khabarova on September 29th. Mr. Jackson had been to Waigatz Island. Mr. Popham gave him a whale-boat, in which Mr. Jackson proposed to go along the coast eastwards from Khabarova, no doubt with the intention of reaching the Yalmal Peninsula. He then intended to return to Khabarova, and proceed to Arkhangel by the Pechora River.

GENERAL.



The Spoon of an Elizabethan Navigator.—When Cavendish sailed on his last voyage in August 1591, there were included in his fleet the *Desire*, commanded by Captain John Davis, the great Arctic discoverer, and the *Dainty*, a barque belonging to Adrian Gilbert (half-brother of Sir Walter Raleigh) and commanded by his intimate friend Captain Randolfe (or Randall?) Cotton. On March 16th, 1592, Captain Cotton had gone on board one of the other ships to dinner, the fleet being at anchor in one of the ports of Patagonia, when the crew of the *Dainty* got her under weigh and made sail for England. Captain Cotton was left with nothing but the clothes he had on. Being a very old friend of Captain Davis he was taken on board the *Desire* as a guest, and so remained during the remainder of the voyage. Captain Cotton was on board the *Desire* in Magellan's Strait in May 1592, and again in October, gales of wind preventing Davis from entering the Pacific on both occasions. Cotton shared the dreadful sufferings of Davis and the crew on the passage home. All the men died of scurvy but sixteen, and of these only five could move. Davis and one boy were in health, Cotton and Mr. Jones, the narrator of the voyage, very ill but able to work. These four brought the ship home, always "mightily and monstrously grieved with the most wofull lamentation of our sick men." On June 11th, 1593, they ran the ship on shore at Berehaven, in Bantry Bay. Davis and Cotton took passage in a fishing-boat, and eventually landed at Padstow, in Cornwall. In the following year, 1593, Cotton joined the expedition of Captain Lancaster against Pernambuco, and was killed in an attack on that town. By a very strange chance, a spoon which was made for Captain Cotton on board the *Desire*, in Magellan Straits, has been preserved among the plate of the Cotton family of Etwall, in Derbyshire. The Rev. R. G. Buckston, of Sutton-on-the

Hill, near Derby, inherited plate once belonging to the Cottons of Etwall, and amongst it was this curious spoon made in Magellan's Straits 300 years ago. Along the handle and back of the spoon is the following inscription:—

“In clymyng hye there was a fall. But yet except the good will of us all
 Though fortune frownde against our wil; yet hope i wel and wil doe stil
 for in the straighes of Magalan Captain Cotton so called by name
 Caused me to be maid in ye month of maye 1592: it is trew yt i saye.”

[C. R. M.]

A Monument to the late Dr. Rae.—A movement has been set on foot for the erection of a monument to the late Dr. John Rae, the well-known Arctic explorer, in St. Magnus Cathedral, Kirkwall, Orkney. Dr. Rae was a native of Orkney, and his remains have been interred in the churchyard of St. Magnus Cathedral. Subscriptions should be sent to the Secretaries (Mr. J. W. Cursiter and Mr. Duncan W. Robertson), Rae Memorial, Kirkwall, Orkney, N.B.

CORRESPONDENCE.

The Determination of Longitudes and Photography.

Dr. Schlichter, in his interesting paper on the ‘Determination of Longitudes by Photography’ (*Journal* for November, p. 423), says quite truly that in my Presidential address at Cardiff, when dealing with the progress in the art of Surveying, I stated that “the photogrammeter had not as yet been utilised for ascertaining the relative positions of celestial bodies.” What I said then is true still, for although Mr. Stolze, and probably others, have repeatedly proposed to take lunar and other astronomical observations by photography, we have scarcely as yet got beyond the experimental stage, and I am not aware that a single determination of that nature has been made in the field.

I quite agree with the leading practical surveyors in their condemnation of the sextant for astronomical work on *terra firma*. The sextant owes its popularity among explorers to its portability and cheapness, but even in skilful hands the results which it furnishes are mere approximations. As far as lunar distances are concerned the photogrammeter, that is a photographic camera constructed with especial view to the requirements of the surveyor, is undoubtedly far preferable to it. The capacities of this instrument have been fully tested, quite a number of patterns of it can be had of continental makers, and it has already rendered good services in the field. Books like Koppe's *Photogrammetrie* (Weimar, 1889) tell us all about the principles of its construction, the manner of determining and eliminating its errors, and the method of computing the angles by measuring distances between the objects photographed, and so forth. The instrument described by Dr. Schlichter is in fact nothing but a “photogrammeter;” and an instrument of this description, of smaller size and lighter make (in bellows-form) than needed for astronomical observations, might profitably be included in the outfit of every traveller.*

If a set of lunars were sufficient to compute a longitude, no better instrument could be desired; but as the observer has to determine the local time as well, he must be furnished in addition with a sextant or theodolite, or, and this would perhaps be preferable, with a photo-theodolite.

This would prove no objection if lunars afforded the only or even the best method of determining a longitude. This, however, is not the case, for there are other methods which yield excellent results, and call for no more skill on the part

* An ordinary camera could easily be adapted to do duty for a photogrammeter.

of the observer than that required for determining the local time. Among these are lunar-zenith distances, equal altitudes, and the method of moon-culminating stars, which last possesses the great advantage of being quite independent of a knowledge of either local or Greenwich time. All these observations can be made with a theodolite, and even lunars might be observed with this instrument if a photo-telescope were to be substituted for the ordinary one. The theodolite is nearly as portable as a sextant of equal power; it is no more liable to injury, and, what is of great importance, its proper use is easily acquired after a short practice.

Of recent years quite a number of longitudes have been satisfactorily determined in Africa by the methods referred to, and the results would have been even better had the explorers condescended to familiarise themselves to a greater extent with their instruments before they started on their travels.

It has been proposed to supersede the ordinary theodolite by a photo-theodolite.* It is claimed, on behalf of this instrument, that astronomical observations of every description (including lunars) can be made with it. This is literally true, but as most altitudes must be read off on a vertical limb the results can under no circumstances be more exact than those obtainable by an ordinary theodolite. As this new instrument is moreover rather cumbersome, explorers will be well advised if they confine themselves to the theodolite, which enables them to do efficiently all the work that is required of them.

E. G. RAVENSTEIN.

"The Trade."

In the sixteenth century some part of the Breton Sea—apparently the fairway off Ushant—was called "the Trade." It is repeatedly mentioned in the first volume of the Calendar of State Papers for Henry VIII. Here are some instances:—

November 17th, 1511. No. 1980.—The Kings of Aragon and England agree "to keep the sea from the Trade to the mouth of the Thames."

1513. No. 4038.—The same two kings agree "to send to sea a sufficient navy, viz., three thousand men on the part of England to protect the Channel between the Trade and the mouth of the Thames, with three thousand on the part of Aragon for the parts beyond the Trade."

Other instances are Nos. 1512, 3243, 3877, 4005, 4019, 4020, 4056, in some of which it is spoken of as "before the haven of Brest," or as, apparently, to seaward of "the Broad Sound before St. Matthew's." I have no note of the term in the Paston Letters, nor does it occur in any of the later Calendars; but within these last few days, in the course of editing the naval papers of 1588 for the Navy Records Society, I have met with it in the letters of Sir William Wynter. Wynter had then been at sea for fifty years, more or less—he served in the expedition to Leith in 1544—and his language may have been a little old-fashioned; but in a letter to Sir F. Walsyngham of June 20th, he says—"There arrived at Dunkirk lately certain Brittany ships, whose mariners should give out that they came in company from Cape Finisterre with 150 ships of war of the king of Spain's, and how that they parted from them upon the coast of Brittany near the Trade; since which time we have had perfect intelligence that the Queen's Majesty's ship, the Elizabeth Bonaventure, hath been within the Trade and thereabouts. Likewise we have spoken with the masters and company of three flyboats . . . that were in Rochelle five days past, and came along all the coast of Brittany and through the Trade. . . ."

* A very elegant 5-in. photo-theodolite is described in Dr. Koppe's book. It packs into a box 21 inches long and 12 inches high. This box serves as a "dark room" for developing the plates, and contains everything needed for photographic purposes. Lechner, of Vienna, sells an eight-inch photo-theodolite, weight 19 pounds, for £45.

Neither Howard, nor yet Drake, Fenner or others of the seamen in the fleet speak of the Trade, though they repeatedly mention Ushant—or, as it often appears, Yewshante; and Sir George Carey, writing to the Earl of Sussex from the Isle of Wight, on July 25th, says, “The fleets keep the direct trade and shot into the sea out of our sight;” where “the trade” would seem to mean “the fairway of the Channel.”

My impression is that the earlier term “the Trade” applied in a general way to the sea off Ushant, as the point to which all the routes of the old *trade* to Bordeaux converged; but I should be very grateful for any clear and distinct information on the subject, and for any reference to its use earlier than 1512, or later than 1588.

J. K. LAUGHTON.

OBITUARY.

Captain J. LYONS McLEOD, R.N., died on October 25th. He entered the navy in 1841, was appointed British Consul at Mozambique in 1856, and remained there until 1858. At that time the slave trade was carried on most actively on the east coast of Africa, and not only many of the Portuguese officials from the governor-general downwards, but also Frenchmen and others openly engaged in it. The British Consul naturally fell under the displeasure of those who profited by the slave-trade; his house was attacked, and his wife nearly died of poison administered by a physician who had been called in professionally. It was greatly to the fearless exposure of the state of affairs by the British Consul that matters began to mend. In 1866-69 Captain McLeod held the appointment of Consul on the River Niger. He was the author of ‘*Travels in Eastern Africa*’ (London, 1860); of ‘*Madagascar and its People*’ (1865); of “Notes on the Zambesi from Quillimane to Tete,” published in our *Proceedings* (1858 p. 363); and of a number of valuable official reports.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1893-94.

First Ordinary Meeting, November 13th, 1893.—CLEMENTS R. MARKHAM, Esq., C.B., F.R.S., President, in the Chair.

The PRESIDENT made the following remarks on taking the Chair:—

As this is the first time I have had the pleasure of addressing you as your President, I take the opportunity of saying that it will be my plan so long as I occupy this Chair to inform you promptly and fully of everything that is likely to interest you, and of every measure that is adopted by our Council, at the evening meetings, and it will also be my endeavour to prevent any difference even of the slightest kind from arising between our Council and the fellows. I was brought up at the feet of Sir Roderick Murchison, the greatest of our Presidents, and I shall endeavour to follow in his footsteps. I shall remember his conviction, which is also mine, that the most important point for the welfare and well-being of this Society is that there should be complete accord between the Council and the great body of the fellows. I have pleasure also in announcing to you several measures that have been adopted within the last year, and which, I trust, will redound to the usefulness and credit of the Society. As you are aware, at the beginning of the present year the monthly publication assumed a new form; not only was it to have a more attractive appearance, but it was so planned as to be in fact a monthly geographical magazine embracing the whole field of Geography. Testimonials from all hands, both from the press and from individuals of eminent position at home and abroad, assure us that the enterprise of this Society in carrying out one of its main objects, the diffusion of geographical knowledge, has been most successful. The sale of the

Journal to the general public is steadily increasing, and this, combined with the increasing number of advertisements, will, it is hoped, in course of time more than cover the extra expenses. With the new year, 1894, our Supplementary Papers will assume a new and more attractive form, with a result, it is hoped, of increasing the sale outside the Society; we have several very important and interesting works on hand to be issued in this form, as the funds of the Society admit of it. Our librarian, Dr. Mill, has been giving a course of lectures, under the Society's auspices, at the London Institution, on Geography as applied to Commerce; and though the fee charged is small, the attendance is so satisfactory that it is hoped the expenses of the lectures will be covered. The second course of a series of lectures by Mr. Mackinder, on Geography and History, will be given in the beginning of the new year. The lectures for young people at Christmas have been kindly undertaken by our Secretary, Mr. Freshfield. Last year the expenses were more than covered, and this year I have no doubt they will be equally successful. I may mention, also, that during the year we have established the most friendly relations with all the other geographical societies in the Empire—both Great Britain and the Colonies, so that any fellow of the Royal Geographical Society will always find a welcome among our sister institutions. Last month I visited the Geographical Societies of Tyne-side, Liverpool, and Manchester, and opened their sessions by reading papers. I experienced most cordial receptions; and I can testify, from personal observation, that these societies are flourishing, and are likely to do much good. You may also be interested to know that a complete new catalogue, arranged according to authors, is in an advanced state of preparation, and at the same time an exhaustive subject-catalogue is in hand, and when complete will be of invaluable service to all interested in geography.

The PRESIDENT then delivered his opening address.

There was the usual reception, and an exhibition of recently-acquired photographs, atlases, etc., in the tea-room.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
 Ann. = Annals, Annales, Annalen.
 B. = Bulletin, Bollettino, Boletim.
 Com. = Commerce, Commercial.
 C. R. = Comptes Rendus.
 Erdk. = Erdkunde.
 G. = Geography, Geographie, Geografia.
 Ges. = Gesellschaft.
 I. = Institute, Institution.
 J. = Journal.
 M. = Mitteilungen.

Mag. = Magazine.
 P. = Proceedings.
 R. = Royal.
 Rev. = Review, Revue, Revista.
 S. = Society, Société, Selskab.
 Sitzb. = Sitzungsbericht.
 T. = Transactions.
 V. = Verein.
 Verh. = Verhandlungen.
 W. = Wissenschaft, and compounds.
 Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

EUROPE.

British Islands.

Gazetteer of the British Isles, Statistical and Topographical. With Census Supplement, 1891, and appendices. Edited by John Bartholomew,

Bartholomew.

F.R.G.S. Edinburgh, John Bartholomew & Co. [1893]: size $10\frac{1}{2} \times 7$, pp. iii., 670, and xxxii. Price 12s. 6d. Presented by the Publishers.

The only changes in this useful book of reference from the former edition published by Messrs. A. & C. Black (see *Proceedings* 9 (1887), 205) are the reduction of price to one-third, the omission of the twenty-three maps and of many of the statistical appendices, and the addition of a tabular statement of the census of 1891, and agricultural and commercial statistics.

France—Surveys.

Ministère de la Guerre. Service géographique de l'Armée. Rapport sur les Travaux exécutés en 1892. Paris, 1893: size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 20.

Germany—Pommerania. *Globus* 64 (1893): 237-241.

Deecke.

Ueber Dünen und Diluvialsande auf den pommerschen Inseln. Von Prof. W. Deecke. Greifswald.

An interesting notice of the sand-dunes along the Baltic coast, showing the importance of wind action on glacial-drift and river-borne sand in modifying the configuration of the coast-lands. There are two maps of typical dune-formations.

Greece.

Bædeker.

Greece. Handbook for Travellers. By Karl Bædeker. Second revised edition. Leipsic, Karl Bædeker. London, Dulau & Co., 1894 [1893]: size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. cxii. and 376. Maps and plans. Price 8 marks. Presented by Messrs. Dulau & Co.

Several new maps and plans have been added to this edition.

Iceland.

Grossmann.

Observations on the Glaciation of Iceland. By Karl Grossman, M.D. Size $9 \times 5\frac{1}{2}$, pp. 12. With map and plate. From the "*Glacialist's Magazine*" for September.

The author visited Iceland in 1892 with the special object of studying the glacial phenomena of the island. His route led north from Reykjavik and then eastward parallel to the north coast.

Ireland—Aran Isles. *P. R. Irish A.* 2 (1893): 768-830.

Haddon and Browne.

The Ethnography of the Aran Islands, County Galway. By A. C. Haddon, Professor of Zoology, Dublin, and C. R. Browne, M.D.

A valuable study of one of the most insular peoples of the British islands, illustrated by a number of characteristic photographs.

Lipari Islands.

[Ludwig Salvator.]

Die Liparischen Inseln. Erstes Heft: Vulcano. Size $16\frac{1}{2} \times 13$, pp. xii. and 96.

Zweites Heft. Salina. Size $16\frac{1}{2} \times 13$, pp. x. and 72. Prag, Heinrich Mercy, 1893. Presented by the Author, the Archduke Ludwig Salvator.

These singularly gorgeous volumes, worthy of exhibition as specimens of the highest art of the paper-maker and printer, are illustrated by numerous engravings, and there are maps of both islands. A special notice must be devoted to their geographical aspects.

Portugal and Spain.

Boutroue.

Rapport a M. le Ministre de l'Instruction publique et des Beaux-Arts sur une Mission Archéologique en Portugal et dans le sud de l'Espagne. Par M. Alexandre Boutroue. Paris, E. Leroux, 1893: size $10 \times 6\frac{1}{2}$, pp. 57. Plates. Presented by the Author.

Russia—Duna.

Sapunov.

The River Western Duna (*Ryeka Zapadnaya Drina*), historical and geographical sketch. By Y. Sapunov. Vitebsk, 1893: pp. 512. With many maps.

The author, who is a well-known explorer of West Russian antiquities, has collected in this bulky volume all that is known on the river and the chief places on its banks. A full geographical description of the Duna, its tributaries, canals, sand-banks, islands, flora, and fauna is given, and it is followed by most valuable historical data and archæological descriptions of towns, castles, &c.

ASIA.

Arabia—Yemen.

Harris.

A Journey through the Yemen, and some general Remarks upon that Country. By Walter B. Harris. Illustrated from sketches and photographs taken by the author. Edinburgh and London, William Blackwood & Sons, 1893: size $8\frac{1}{2} \times 6$, pp. xii. and 386. Price 16s. Presented by the Publishers.

Mr. Harris had an adventurous time in Yemen, crossing the Turkish frontier in disguise, and expiating his rashness by a very unpleasant imprisonment. He was successful in reaching Sanaa, the capital of the Yemen from Aden, and returned under escort to Hodeida. Apart from the narrative of his personal travels, Mr. Harris gives a brief summary of the geography and history of Yemen. Numerous illustrations enhance the value of the book, which is also furnished with a sketch map of the author's route.

Asia-Minor.

Globus 63 (1893): 349-354. 64 (1893): 153-158, 196-202.

Belck.

Untersuchungen und Reisen in Transkaukasien, Hoch-Armenien und Kurdistan. Von Dr. Waldemar Belck.

Baluchistan—Quetta.

The Quetta Directory for 1893. As compiled by the late Mr. R. R. Golwala, and published by R. R. Golwala & Co. Quetta, 1893: size $9 \times 6\frac{1}{2}$, pp. 152. Presented by Major R. B. Burnaby.

Includes a brief sketch of Baluchistan, its extent, physical features, productions, population, geographical divisions, including Persian Baluchistan, Kalati, Baluchistan, and British Baluchistan.

India—Darjiling and Sikkim.

Waddell.

Place- and River-Names in the Darjiling District and Sikkim. By L. A. Waddell, M.B. [*From the Journal of the Asiatic Society of Bengal, vol. lx., part i., No. 2, 1891.*] Pp. 27. Presented by the Author.

India—Islands.

J. Asiatic S., Bengal 62, Pt. II. (1893): 39-86.

Prain.

On the Flora of Narcondam and Barren Island. By D. Prain.

Narcondam and Barren Island lie in the Andaman Sea, east of the Andaman Islands. Mr. Prain's paper is of geographical as well as botanical importance, and will be summarised in the Monthly Record.

India—Rājputāna—Currencies.

Webb.

The Currencies of the Hindu State of Rājputāna. By William Wilfrid Webb, M.B. London, A. Constable & Co., 1893: size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. xxi. and 135. Presented by the Publishers.

Illustrated by a map showing the mint towns of Rājputāna, and by twelve plates of coins.

India—South Bihar.

Waddell.

On some new and little-known Hot Springs in South Bihar. By L. A. Waddell, M.B. [*Reprinted from the Journal of the Asiatic Society of Bengal, vol. lxx., part ii., No. 3, 1890.*] Calcutta, 1890: size $9 \times 6\frac{1}{2}$, pp. 13. Presented by the Author.

India—Surveys.

Hill.

Trigonometrical Branch. Survey of India. Spirit-levelled heights. No. 7. Bombay Presidency, Hyderabad Assigned Districts, and Central Provinces. Seasons 1890-92. Prepared in the Office of the Tidal and Levelling Party by Lieutenant-Colonel J. Hill, R.E., under the directions of Colonel G. Strahan, R.E., Deputy Surveyor-General, Trigonometrical Branch. Published under the orders of Colonel H. R. Thuillier, R.E., Surveyor-General of India. Dehra Dun, 1893: size $9\frac{1}{2} \times 6\frac{1}{2}$. Plate. Price 1 rupee. Presented by the Survey of India.

Japan—Geology.

Naumann.

Neue Beiträge zur Geologie und Geographie Japans. Von Dr. Edmund Naumann. Gotha, Justus Perthes, 1893: size 11×8 , pp. 46. Maps. Price 3-60 marks.

Ergänzungsheft No. 108 of *P. Hermanns Mittheilungen*. Dr. Naumann first deals with the explosive eruptions of Shirane and Bandaisan, then details the geological structure

of the central area in the main island known as the *fossa magna*, discussing its relation to orogenic agencies at work in Japan, and finally he describes, with an effective contoured map, the orography of the whole Japanese group.

Malay Archipelago.

Pictet and Bedot.

Camille Pictet et Maurice Bedot. *Compte Rendu d'un voyage scientifique dans l'Archipel malais.* Genève, A. Cherbuliez, 1893: size 10 × 6½, pp. 61. *Presented by Professor Paul Chaz.*

Sketch of a zoological sojourn in the Malay Archipelago in 1890, with lists of equipments which were found useful on the trip. This is an introduction to the detailed study of the terrestrial and marine fauna, which it was the object of the Swiss naturalists to collect and describe.

Palestine.

Dickson.

Report on the Jaffa-Jerusalem Railway (with plans). Foreign Office Reports, 1893. Miscellaneous Series No. 288. Turkey. By Consul J. Dickson, Jerusalem. Size 10 × 6, pp. 8. *Price 7d.*

A short account of this railway was given in the *Proceedings*, Vol. XIV., p. 801. The present Report is valuable on account of its map of the whole line on a large scale. One passenger train and one goods train run each way daily between Jaffa and Jerusalem. In addition to the plans for extending the railway mentioned in the note referred to, the project of carrying the line on to El-Arish and thence possibly to join the Egyptian railways has been discussed. The feasibility of carrying a line from El-Arish to Akaba in connection with a new route to India has also been spoken of.

Pataliputra.

Waddell.

Discovery of the exact Site of Asoka's Classic Capital of Pataliputra, the *Palibothra* of the Greeks, and description of the superficial Remains. By L. A. Waddell, M.B. Calcutta, Bengal Secretarial Press, 1892: size 11 × 8½, pp. 29. *Map, plate, and plans. Presented by the Author.*

Mr. Waddell claims to have discovered the exact site of Pataliputra, which he places in the neck of land lying between the old channel of the Son River and the Ganges, at their junction, and immediately adjacent to the modern city of Patna.]

Tibet.

An Englishwoman in Tibet. By Annie R. Taylor. Size 10 × 6½, pp. 11. *From the "National Review" for September, 1893.*

AFRICA.

Africa.

Brown.

The Story of Africa and its Explorers. By Robert Brown, PH.D. Vol. II. The River of Egypt—The Great Lakes—Across the Continent—The Congo. With two hundred original illustrations. London, Cassell & Co., 1893: size 10½ × 7½, pp. viii. and 312. *Presented by the Publishers.*

Being popular rather than systematic in its plan, this book should help to spread a knowledge of Africa in quarters where a more elaborate treatise would find no admittance. In this volume Dr. Brown has availed himself of the help of other African specialists. Dr. Murie writes the chapter on "The River of Egypt: Seekers after its Source;" Commander Cameron and Mr. F. E. Harman contribute part of several chapters, and Dr. Felkin tells the story of the exploration of the Congo.

African Languages.

Cust.

Essay on the Progress of African Philology up to the year 1893. Prepared for the Congress of the World at Chicago, U.S., by Robert Needham Cust, LL.D. With three appendices:—A. Bibliographical Table of Languages, Dialects, Localities, and Authorities, 1883 to 1893. B. List of Translations of the Bible (whole or part) up to 1893. C. List of Scholars who have contributed to our knowledge up to 1893. London, Elliot Stock, 1893: size 9 × 6, pp. 48. *Presented by the Author.*

Dr. Cust views Philology as capable of forming part of Geography. "The first branch of that science is no doubt 'Physical,' and its second 'Political,' but a third and a fourth are distinctly marked out, 'Ethnographical' and 'Linguistic.'" This little book is a supplement to the author's comprehensive 'Sketch of the Modern Languages of Africa,' published in 1883, carrying its valuable tables on to 1893.

British Central Africa.**Rankin.**

The Zambesi Basin and Nyasaland, by Daniel J. Rankin. Edinburgh and London, William Blackwood & Sons, 1893: size $8 \times 5\frac{1}{2}$, pp. viii. and 278. *With map and illustrations. Price 10s. 6d. Presented by the Publishers.*

Mr. Rankin writes with a sarcasm rare in travellers, and depicts in very dark colours the life and conduct of the natives and Europeans whom he encountered in his journeys on the Zambesi and in Nyasaland. A chapter on Mombasa, and another on boat-cruising on the East African coast, give a wider scope to the work than the title implies. Mr. Rankin's views of the administration of British Central and South Africa are pessimistic.

British East Africa.**M-Dermott.**

British East Africa or *Ibea*, a History of the Formation and Work of the Imperial British East Africa Company. Compiled by the authority of the directors from official documents and the records of the Company. By P. L. M-Dermott, Assistant Secretary. London, Chapman & Hall, 1893: size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. xvi. and 382. *Price 6s. With map and frontispiece (portrait of Sir Wm. Mackinnon.) Presented by the Publishers.*

This timely volume presents a concise and straightforward epitome of the origin and growth of the British East Africa Company, commencing with the first negotiations for the cession of the Sultan of Zanzibar's coast territory, and the long and troublesome disputes as to spheres of influence and boundaries with the German Company, especially as regards Vitu, Manda, Patta, and Wanga. Then follow several chapters describing and vindicating the Company's action in Uganda, and a general statement of the present position of affairs in the Territory. A bundle of appendices, reproducing the text of treaties, concessions, and diplomatic correspondence, enhances the value of the book. There is a good index.

Egypt.**Amélineau.**

La Géographie de l'Egypte à l'époque Copte. Par E. Amélineau. Paris, Imprimerie Nationale, 1893: size $11 \times 7\frac{1}{2}$, pp. xxxviii. and 630. *Price 35s.*

A very learned and laborious treatise on Coptic geography. The author has consulted the Coptic and Arabic MSS. preserved in the principal libraries of Europe with the exception of those of Berlin, Vienna, and St. Petersburg, and has culled from these documents all the names of towns, villages, hamlets, and, in some cases, even of streets. These are arranged in alphabetical order (according to the French transliteration), and under each head is summarised all that he could ascertain of the position, population, and historical changes of the place. An index of the Coptic names in the original character, and another of the names as transliterated, are given; but the volume would gain much in facility of reference if the names discussed on each page were indicated in the running title after the manner of other dictionaries.

Lagos.**Payne.**

Table of principal events in Yoruba History, with certain other matters of general interest, compiled principally for use in the Courts within the British Colony of Lagos, West Africa. By John Augustus Otonba Payne. Lagos, n. d. (1893): size $10 \times 6\frac{1}{2}$, pp. 114. *Presented by the Author.*

A number of useful tables are here presented, including the native phrases used to express the titles and duties of officials.

South Africa.**Noble.**

Illustrated Official Handbook of the Cape and South Africa. A *résumé* of the History, Conditions, Populations, Productions, and Resources of the several Colonies, States, and Territories. Edited by John Noble. Cape Town, J. C. Juta & Co., 1893: size $8\frac{1}{2} \times 6$, pp. xvi. and 568. *Map and illustrations. Presented by Mr. John Noble.*

Another copy. London, E. Stanford, 1893. *Price 8s. 6d. Presented by Mr. E. Stanford.*

The new issue of the 'Official Handbook' embraces some account of the past and present conditions of the whole of South Africa. The information appears to have been brought up to date, and is sufficiently full for reference purposes, although in the absence of an index it is very troublesome to turn up any subject specially wanted.

NORTH AMERICA.

United States—Mississippi River.

Glazier.

Headwaters of the Mississippi: comprising biographical sketches of early and recent explorers of the Great River, and a full account of the discovery and location of its true source in a lake beyond Itasca. By Captain Willard Glazier. Chicago and New York, Rand, McNally & Co., 1893: size $7\frac{1}{2} \times 5$, pp. 528. *Illustrated. Presented by the Author.*

Captain Willard Glazier, whose expedition to the head-waters of the Mississippi is referred to in the *Proceedings* for 1887, Vol. IX., pp. 58, 119, 211, and 717, paid a second visit to the same region in 1891 with a number of friends. It appears that his claims as an explorer and discoverer have been neglected or laughed at by many American authorities, and much of this volume is devoted to personal retorts and laborious vindication. The point at issue seems to us a small one, although Captain Glazier ascribes to it much geographical importance. In the absence of a detailed survey of the region south of Lake Itasca, no geographer would be justified in pronouncing a definite judgment on the separate existence, exact elevation, or orientation of the sheet of water which the author names after himself. The map on p. 408 has no scale, and is boldly unconventional in draughtsmanship; that on p. 340 is a mere sketch with an "approximate scale of miles," and the two differ in their topography. Apart from the trifling controversy, the book is readable and the illustrations of rare excellence.

United States—Nebraska.

Bentley.

Johns Hopkins University Studies. Eleventh Series, VII.-VIII. The Condition of the Western Farmer as illustrated by the Economic History of a Nebraska Township. By Arthur F. Bentley, A.B. Baltimore, 1893: size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 92.

An account of Harrison's Township in Nebraska.

CENTRAL AND SOUTH AMERICA.

Central America.—Archæology.

Maudslay.

Biologia Centrali-Americana, or Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America. Edited by F. Ducane Godman and Osbert Salvin. Archæology, by A. P. Maudslay. London, published for the Editors by H. H. Porter, 1893: Text pp. 55-64; Plates LXXIV.-XCIX.

West Indies.

Esquemeling.

The Buccaneers of America. A true account of the most remarkable assaults committed of late years upon the coasts of the West Indies by the Buccaneers of Jamaica and Tortuga (both English and French). Wherein are contained more especially the Unparalleled Exploits of Sir Henry Morgan, our English Jamaican hero, who sacked Portobello, burnt Panama, etc. By John Esquemeling, one of the Buccaneers who was present at those tragedies. Now faithfully rendered into English. With facsimiles of all the Original Engravings, &c. London, Swan Sonnenschein & Co., 1893: size $10 \times 6\frac{1}{2}$, pp. xxxvi. and 508. Price 15s. *Presented by the Publishers.*

This is "reprinted from the edition of 1684, to which is added a reprint of the very scarce Fourth Part, by Basil Ringrose (1685), containing the 'Dangerous Voyage and Bold Attempts of Captain Bartholomew Sharp and others.' Edited with an Introduction by Henry Powell." It is a handsome reprint, recalling the memory of a very stirring time in West Indian history, when the Buccaneers were not yet lost to feelings of patriotism, and had not wholly sunk into the ignominy of pirates.

POLAR REGIONS.

Antarctic Continent. *R.G.S. Supplementary Papers* 3 (1893): 607-637.

Forbes.

The Chatham Islands: their Relation to a Former Southern Continent. *With map.*

This paper was read at an evening meeting of the Society, and is published with the discussion which took place on the occasion.

Greenland.*Ausland* 66 (1893): 662-663, 679-682.**Rink.**

Nachhall der ersten Nansen-Expedition. Berichte der Eskimos Arkaluk und Welene in Godthaab. (Uebersetzt von Signe Rink in Christiania).

Translated from a native journal, these articles show how the unexpected visit of Dr. Nansen and his companions to Godthaab stirred the quaint little community in which they spent a winter, and incidentally they serve as an interesting commentary on Dr. Nansen's last book, 'Eskimo Life.'

Nansen's Expedition. *Norske G. S. Årbog* 4 (1892-93): 86-104.

Bjørlikke.

Den Norske nordpolsekspedition. K. O. Bjørlikke.

This short notice of the equipment of the *Fram* is accompanied by illustrations of the ship as completed, and portraits of Nansen and his eleven companions.

Peary's First Journey. *Norske G. S. Årbog* 4 (1892-93): 24-44.

Astrup.

Eivind Astrup; Loitnant Peary's Grønlandsekspedition 1891-92.

Gives, with a map, an account of Peary's discovery of Independence Bay. Mr. Astrup, it will be remembered, was Mr. Peary's second in command on the expedition, and has again gone out with him on his present journey.

AUSTRALASIA AND PACIFIC ISLANDS.**Australia—Historical.****Calvert.**

The Discovery of Australia. By Albert F. Calvert. London, George Philip & Son, 1893: size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. vi. and 92. *With maps and illustrated appendix.* Price 10s. 6d. *Presented by the Publishers.*

Another copy, specially bound. *Presented by the Author.*

Mr. Calvert suggests no theory and makes no new claims as to priority of discovery, but limits himself to reproducing certain early maps to indicate the growth of our knowledge of Australia, and acknowledges his indebtedness to many other writers for the notes which accompany them.

Polynesia.**Melville.**

Typee: a narrative of a four months' residence among the natives of a valley of the Marquesas Islands; or a peep at Polynesian Life. By Herman Melville. New edition, with a Memoir of the Author and Illustrations. London, John Murray, 1893: size $7\frac{1}{2} \times 5$, pp. xxx. and 302. Price 3s. 6d. *Presented by the Publisher.*

Omoo: a narrative of adventures in the South Seas; a sequel to 'Typee; or, the Marquesas Islanders.' By Herman Melville. New edition, with a Memoir of the Author and Illustrations. London, John Murray, 1893: size $7\frac{1}{2} \times 5$, pp. xxvi. and 322. Price 3s. 6d. *Presented by the Publisher.*

Mr. Murray has conferred no slight favour on the public by producing a new edition of these delightful travels, which abound with adventures enough to please the most careless, are written with a simple honesty which makes them charming as literary productions, and detail the state of things in Polynesia half a century ago when the idyllic life of the peaceful primitive peoples had not been everywhere broken in upon by the trader and missionary.

Western Australia.**Calvert.**

The Mineral Resources of Western Australia. By Albert F. Calvert. London, George Philip & Son, 1893: size $7\frac{1}{2} \times 5$, pp. 180. Price 2s. *Presented by the Publishers.*

All except thirty pages are devoted to the description of West Australian gold-fields; the remainder treats of other mineral resources. Mr. Calvert made two journeys in Western Australia in behalf of "Exploration companies."

Western Australia.**Streich.**

Scientific Results of the Elder Exploring Expedition. Geology and Meteorology. By Victor Streich. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. [68]. *Extract.* *Presented by the Author.*

The report is illustrated by a sketch-map of the geology of the route, and by numerous other illustrations.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

- Climate and Famines.** *Ausland* 66 (1893): 673-677. **Krebs.**
Witterungsverlegung von niederen nach höheren Breiten. Von Wilhelm Krebs (Berlin).

An attempt to connect the occurrence of years of scarcity with weather changes from south to north in different parts of the world.

- Density of the Earth.** *Sitzb. A. W. Wien. (Abt. IIa.)* 101 (1893): 1528-1536. **Tumlirz.**
Die Dichte der Erde, berechnet aus der Schwerebeschleunigung und der Abplattung.

Summarised on p. 375, this volume.

- Oceanography.** *C. R.* 116 (1893): 1321-1324. **Buchanan.**
Sur la densité et l'alcalinité des eaux de l'Atlantique et de la Méditerranée.

Summarised on p. 374, this volume.

- Oceanography.** **Schott.**
Wissenschaftliche Ergebnisse einer Forschungsreise zur See, ausgeführt in den Jahren 1891 und 1892. Von Dr. Gerhard Schott. Gotha, Justus Perthes, 1893: size 11 × 8, pp. 132. *Maps, tables, and diagrams. Price 8 marks.*

This forms Ergänzungsheft No. 109 of *Petermanns Mittheilungen*, and its contents will be separately summarised.

- Oceanography—Atlantic.** **Krümmel.**

Reisebeschreibung der Plankton-Expedition. Von Dr. Otto Krümmel, Professor der Geographie in Kiel. Kiel and Leipzig, Lipsius and Tischer, 1892: size 13½ × 11, pp. 330. *Maps and illustrations.*

Geophysikalische Beobachtungen der Plankton-Expedition. Von Dr. Otto Krümmel. Mit 2 Karten. Kiel and Leipzig, Lipsius and Tischer, 1893: size 13½ × 11, pp. 120. *Presented by the Author.*

These volumes form the geographical part of the publications of the scientific results of the voyage of the *National* for the investigation of the biological conditions of the Atlantic Ocean in 1890. The publication will include a large number of monographs on the various forms of life collected. The narrative of the voyage, and a summary of the physical results, will be referred to at greater length in an article in the *Journal*.

- Oceanography—Baltic.** *Ausland* 66 (1893): 627-630, 648-651. **Schück.**

Beobachtungen über Salzgehalt und spezifisches Gewicht des Meerwassers zwischen den Norwegischen Scherren. Von A. Schück, Hamburg.

A discussion of the method of determining the density of sea-water and its value at various temperatures.

- Plant Distribution,** **Jännicke.**

Jahrb. Frankfurter V. G., &c. 55 and 56 (1890-92): 1-30.

Die Entdeckung Amerikas in ihren Einflüsse auf die Geschichte der Pflanzenwelt in Europa. Von Dr. Wilhelm Jännicke.

A short treatise on the American plants introduced to Europe.

GENERAL.

- Biographical Dictionary.** **Lee.**

Dictionary of national Biography. Edited by Sidney Lee. Vol. xxxvi. Malthus—Mason. London, Smith, Elder & Co., 1893: size 9½ × 6½, pp. vi. and 447. *Price 15s.*

This volume includes notices of the following names more or less connected with geography and travel:—Sir John Mandeville, by G. F. Warner; James Mangles, by Prof. J. K. Laughton; Thomas Manning, by W. P. Courtney; Charles Blackford Mansfield, by J. A. Cramt; Augustus Raymond Margary, by G. C. Bease; Lieutenant-General Frederick Markham, by H. M. Chichester; Samuel Marsden, by G. C. Bease; William Marsden, by Warwick Wroth; Charles Thomas Marvin, by G. C. Bease; and John Mason, by T. Seecombe.

Biography—De Candolle. *Deutsche Rundschau G.* 16 (1893): 40–43. **Wolkenhauer.**
Alphonse de Candolle. Von W. Wolkenhauer. *With portrait.*

Cartier's Explorations. **Winsor.**
The Results in Europe of Cartier's Explorations, 1542–1603. By Justin Winsor. Cambridge, [Mass.], J. Wilson & Son, 1892: size $9\frac{1}{2} \times 6$, pp. 19. *Presented by the Author.*

Church Missionary Society.
Proceedings of the Church Missionary Society for Africa and the East. Ninety-fourth Year, 1892–93. London, 1893: size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. lxxviii., 260, and (330). *Maps. Presented by the Church Missionary Society.*

Columbus. *Norske G. S. Årbog* 4 (1892–93): 67–85. **Storm.**
Dr. Gustav Storm: Columbus på Island og vore forfædres opdagelser i det nordvestlige Atlanterhav.

Discussing the relation which the Norse discovery of America bore to the voyage of Columbus.

Commercial Treaties. **Hertslet.**
A Complete Collection of the Treaties and Conventions, and Reciprocal Regulations at present subsisting between Great Britain and Foreign Powers, &c., &c. Compiled . . . and edited by Sir Edward Hertslet, K.C.B. Vol. xviii. London, Butterworths, 1893: size 9×6 , pp. xxxii. and 1332.

This volume contains the treaties and other documents from January 1st, 1888, to December 31st, 1890, and some of earlier dates which were not published in previous volumes.

Geographical Exhibition. *B.S.R. Belge G.* 17 (1893): 311–359. **Blanc.**
L'Exposition Géographique de Moscou en 1892. Par M. Edouard Blanc.

This is a good general account of the Moscow geographical exhibition, which took place last year and excited almost no interest in this country. M. Blanc shows that the exhibition was really both interesting and important, giving occasion for a number of demonstrations in which various classes of exhibits were described by specialists. It was mainly a Russian exhibition, and the few foreigners whom the dread of cholera did not deter from visiting Moscow, were much impressed by the excellence of the work done by the official geographical institutions.

Geographical Teaching. **Viguiet.**
La Géographie dans les Chaires de l'Université. Par Maurice Viguiet, Docteur ès Sciences. Avignon, Seguin Frères, 1893: size $10 \times 6\frac{1}{2}$, pp. 32.

A clever, but not too good-natured, pamphlet, pointing out the slipshod writing in elementary text-books written by French geographers of University standing.

Geographical Year-book. **Wagner.**
Geographisches Jahrbuch. XVI. Band, 1893. . . herausgegeben von Hermann Wagner. Gotha, Justus Perthes, 1893: size 9×6 , pp. 500. *Price 12 marks.*

This invaluable epitome of geographical progress contains articles on "Advances in Physical Geography in General," by Dr. H. Hergesell and Dr. E. Rudolph; on "The Geological Aspects of Physical Geography" (IV. 1890–92), by Dr. Franz Toula; "Report on Oceanography for 1891–92," by Professor O. Krummel; "Report on the Geography of Plants (1890–92)," by Dr. O. Drude; "Record of Geographical Exploration in Extra-European Regions," by Dr. F. Hahn, for Australasia and Africa; Dr. G. Wegener, assisted by Professor D. N. Anutschin, of Moscow, for Asia (this section is exceptionally rich in Russian exploration), Dr. W. Sievers for Latin America, and Dr. B. Weigand for North America. Last in the table of contents, though first in the book, is a paper by Professor Egli on "Progress in the Study of Geographical Names."

Historical Geography—**Madoc.** **Stephens.**

Madoc. An Essay on the Discovery of America. By Madoc ap Owen Gwynedd in the Twelfth Century. By Thomas Stephens. London, Longmans, Green & Co., 1893: size 9×6 , pp. xviii. and 250. *Price 7s. 6d. Presented by the Publishers.*

Further notice will be taken of this book.

Portuguese Missions.**D'Orsey.**

Portuguese Discoveries, Dependencies, and Missions in Asia and Africa. Compiled by the Rev. J. D. D'Orsey, B.D. London, W. H. Allen & Co., 1893: size 8 x 5, pp. xvi. and 434. *Price 7s. 6d. Presented by the Publishers.*

The title is somewhat misleading, as the volume deals mainly with the ecclesiastical history of European intercourse with India. At the beginning, fifty pages are devoted to Portuguese discoveries and conquests in the fifteenth and sixteenth centuries; and the remainder of the work is divided into four books, entitled respectively—The Portuguese Missions in Southern India, The subjugation of the Syrian Church, Subsequent Missions in Southern India, with special reference to the Syrians, The Portuguese Missions, with special reference to modern Missionary Efforts in South India. These titles are descriptive of the subject-matter; but the utility of the whole as a work of reference is neutralised by the want of an index.

Transit of Venus.

Observations of the Transit of Venus, 9 December, 1874; made at Stations in New South Wales. Under the direction of H. C. Russell, B.A., &c. Sydney, C. Potter, 1892; size 11 x 9, pp. xxviii. and 43. *Illustrated with photographs and drawings.*

NEW MAPS.By **J. COLES**, *Map Curator*, R.G.S.**EUROPE.****England and Wales.****Ordnance Survey.**

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Karte des Deutschen Reiches. Scale 1 : 100,000, or 1·5 statute mile to an inch. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1893. Sheets :—133, Borkum; 482, Hof; 617, Offenburg; 631, Waldkirch. *Price, 1·5 mark each sheet.*

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Vogel.

Karte des Deutschen Reichs im Massstab 1 : 500,000 (or 7·9 stat. miles to an inch) unter redaktion von Dr. C. Vogel ausgeführt in Justus Perthes' Geographischer Anstalt in Gotha. 27 Blätter in Kupferstich. *Price of the complete map, 42 marks.*

With the issue of sheet 27 (Munich) this excellent map of the German Empire is complete. It is twelve years since it was commenced, and the compilation must have entailed a vast amount of work. As a specimen of cartography it leaves nothing to be desired, and reflects credit on all concerned in its production. The hill-work is in brown, and is most effective, the lettering clear, and the main rivers and lakes are in blue. For purposes of general reference this map will be found much more convenient than the large Government survey map, on the scale of 1 : 100,000, the bulk of which, indeed, renders it unsuited for private collections. The parts, each containing two maps, may be purchased separately, and an index of all the names which appear on the map will shortly be issued.

Mont Blanc.

Whymper.

The Chain of Mont Blanc, by E. Whymper, after the surveys of Captain Mieulet, General Dufour, and Mr. A. A. Reilly. Engraved by J. Addison, Jun. Scale, 1 : 104,544, or 1·65 stat. miles to an inch. *Presented by E. Whymper, Esq.*

This map has been compiled by Mr. Edward Whymper, from all the most reliable sources, and from his own personal observations. It contains several important corrections on previously published maps. Is drawn in a remarkably clear and effective style, and is a fine specimen of engraving. It shows the author's routes, routes of other mountaineers, and frontiers. The heights are also shown in English feet.

ASIA.

India.

Surveyor-General of India.

Indian Atlas. Quarter Sheets: 4A, N.E. Part of Cutch (Bombay Presidency). 129, N.E. Parts of District Lakhimpur (Assam), and the Miri and Mishmi Hills. 130, S.W. Parts of Districts Nowgong, Cachar and Naga Hills, and Manipur, Native State (Assam). Sheets: 29, District Gujrat and Parts of Districts Jhelum, Rawal-Pindi, and Sialkot (Punjab), with Parts of Kishtwar, Nowshera, Badrawar, and Jummoo (Kashmir Territory). 68, Districts Etah, Farukhabad, Manipuri, Etawah, Cawnpore, and Budaon, of the North-West Provinces, with Sitapur, Hardoi, Unao and Kheri, of Oudh, and Part of Gwalior and Dholpur (Native States). 74, Parts of Districts Yelgandal, Indur, Medak, Sirpur Taudur, and Khamamet (Nizam's Dominions), District Chanda and Native State Bastar (Central Provinces). 75, Parts of Districts Medak, Yelgandal, Hyderabad, Khamamet, Nagadkarnul, and Nalgonda (Nizam's Dominions), and Kistna (Madras Presidency). 106, Part of District Sambalpur and Garhjat States of Raigarh, Sarangarh, Sonpur, Rairakhol, and Bamra (Central Provinces), and Baud, Athmallik and Angul (Orissa Tributary States). 116, Parts of Districts Cuttack, Puri, and Tributary States of Baramba, Nayagar, Ranpur, Tigiria, &c. (Bengal).—India, showing railways with stations, accompaniment to alphabetical list of stations on Indian Railways, corrected to June 30th, 1892, 1 inch to 64 miles. 2 Sheets.—Bombay Survey, 1 inch to a mile: No. 188, Parts of Baroda State and Khandesh District. Season 1890-91. No. 304, Districts Belgaum and Bijapur, and States Ramdurg, Mudhol, and Kolhapur. Seasons 1890-91.—Punjab Survey, 1 inch to 1 mile. No. 213, District Ferozepore, and Bahawalpur State with overlap of District Montgomery. Seasons 1869-70, 1877-79, and 1887-88. No. 239, Districts Ferozepore, and Ludhiana and Sikh States. Seasons 1887-88, and 1889-90. No. 240, Districts Ludhiana and Ferozepore, and Sikh States. Seasons 1887-88 and 1889-90. No. 256, District Hissar and Patialar State. Seasons 1847-50, 1870-72, 1883-84 and 1888-90. No. 271, Parts of Districts Ludhiana and Karnal, and Sikh States. Season 1887-88. No. 273, District Karnal, and Sikh States. Seasons 1870-72 and 1887-88.—Assam Survey, 1 inch to a mile. Sheet No. 25 (2nd Edition), District Kamrup. Seasons 1866-68 and 1883-86. No. 97, District Lakhimpur. Seasons 1869-71. No. 113, District Lakhimpur. Seasons 1867-70. No. 128, District Lakhimpur. Seasons 1867-70. No. 145, District Lakhimpur. Season, 1872-73. No. 146, District Lakhimpur. Season 1872-73.—Bengal Survey, 1 inch to a mile. No. 361, District Mymensingh. Seasons 1850-57.—Madras Survey, 1 inch to a mile. No. 150, Part of District Madura. Seasons 1879-88.—Lower Burma Survey, 1 inch to a mile. No. 143 (2nd Edition), District Bassein. Seasons 1880-81 and 1886-87. No. 144, District Bassein. Season 1886-87. No. 185 (2nd Edition), Districts Bassein, Henzada, and Thongwa. Seasons 1881-85 and 1888-89. No. 187 (2nd Edition), Districts Bassein and Thongwa. Seasons 1880-82 and 1888-89. No. 188 (2nd Edition), Districts Bassein and Thongwa. Seasons 1879-81 and 1887-91. No. 190, District Thongwa. Season 1890-91, No. 233 (2nd Edition), Districts Hanthawaddy and Thongwa. Seasons, 1882-83 and 1888-89. No. 283 (2nd Edition), Districts Hanthawaddy and Thongwa. Seasons 1881-82 and 1890-91. No. 284, District Thongwa. Season 1890-91.—Map of Punjab, 16 miles to 1 inch. 2 Sheets, 1893.—The Province of Assam under the jurisdiction of the Chief Commissioner, 24 miles to 1 inch, with additions and corrections up to 1891.—Mysore, 16 miles to 1 inch, February, 1893. Map of the Fyzabad Division, prepared in accordance with Govt. N.W.P. and Oudh P.W. Dept., Circular No. E, dated May 16th, 1872. Revised up to April 1st, 1892, 4 miles to 1 inch. 4 sheets.—Map of the Lucknow Division, prepared in accordance with Govt. N.W.P. and Oudh P.W. Dept., Circular No. E, dated May 16th, 1872. Revised up to April 1st, 1891, 4 miles to 1 inch. 3 sheets.—District Midapore, 4 miles to 1 inch. Additions to January, 1893.—District Palaman, Bengal, 1 inch to 12 miles. 1893.—District Baraich, N.W.P. and Oudh, 1 inch to 8 miles. 1892.—District Badasore, Bengal, 1 inch to 8 miles. 1890. Presented by *H.M. Secretary of State for India, through India Office.*

Japan.

Naumann.

Der Krater des Shiranesan bei Ksats nach der Explosion vom 6 August, 1892. Scale 1 : 65,000, or 1.02 statute mile to an inch. Ansichten des Bandai. Stereographische Darstellung der Geologie Japans. Von Dr. Edmund Naumann. Höhenschichten-Karte von Japan. Von Dr. Edmund Naumann. Scale 1 : 2,600,000, or 41 statute miles to an inch. *Petermanns Geographische Mittheilungen*. Ergänzungsheft, No. 108. Taf. 1, 2, 3. Gotha, Justus Perthes, 1893. *Presented by the Publisher.*

AMERICA.

Cherokee Outlet.

Rand, McNally & Co.

New Sectional Map of the Cherokee Outlet. Scale, 1 : 316,800, or 5 stat. miles to an inch. Rand, McNally & Co., Chicago and New York, 1893. *Presented by the Publishers, through E. Stanford.*

This map has been specially prepared for the use of settlers in the Cherokee Outlet, a district which was thrown open to settlers by the president's proclamation on September 16th, 1893. The map is accompanied by a summary of the United States pre-emption and homestead laws, and the price of land in different districts is also given.

United States.

Rand, McNally & Co.

Rand, McNally & Co.'s Indexed County and Township Pocket Map and Shippers' Guide of Alabama. Scale 1 : 854,100, or 13.5 stat. miles to an inch.—Arkansas. Scale 1 : 854,100, or 13.5 stat. miles to an inch.—California. Scale 1 : 2,629,400, or 32.0 stat. miles to an inch.—Florida. Scale 1 : 854,100, or 13.5 stat. miles to an inch.—Mississippi. Scale 1 : 854,100, or 13.5 stat. miles to an inch. Rand, McNally & Co., Chicago and New York, 1893. *Price 1s. 2d. each. Presented by the Publishers, through E. Stanford.*

These belong to a series of maps in course of publication by Rand, McNally & Co., of Chicago and New York. They have been specially prepared for the use of tourists and persons doing business in the United States.

AUSTRALASIA.

Celebes.

Wichmann.

Die Binnenseen von Celebes. Von Dr. A. Wichmann. Das Stromgebiet des Tjenrana (Süd-Celebes). Der See von Tondano und seine Umgebung. Geologische Skizzen von Dr. A. Wichmann. See von Limboto. *Petermanns Geographische Mittheilungen*. Jahrgang, 1893. Taf. 16. Justus Perthes, Gotha. *Presented by the Publisher.*

PACIFIC OCEAN ISLANDS.

Marshall Islands.

Linnemann.

Langhans: Beiträge zur Kenntniss der Deutschen Schutzgebiete Bl. 4. Dschalut (Regierungssitz des Schutzgebietes der Marshall Inseln). Auf Grundlage einer Vermessung des Ingenieurs B. Linnemann. With insets. *Petermanns Geographische Mittheilungen*. Jahrgang, 1893. Tafel 17. Justus Perthes, Gotha. *Presented by the Publisher.*

GENERAL.

Historical Geography.

Schrader.

Atlas de Géographie Historique. Ouvrage contenant 54 grandes Cartes doubles en couleurs, accompagnées d'un Texte Historique au dos et d'un grand nombre de cartes de détail, figures, diagrammes, etc. Par une Réunion de Professeurs et de Savants sous la direction géographique de F. Schrader, Directeur des travaux cartographiques de la librairie Hachette et Cie. Paris, Librairie Hachette et Cie., 1893. 2^{me} Livraison. *Price 1 fr. 50 c. Presented by the Publishers.*

The present issue contains maps of the World in 720 B.C., with insets; Europe, after the Peace of Utrecht; and the Colonial expansion of England and France from 1815 to 1893. The maps are each accompanied by descriptive letterpress.

Physical Geography.**Staggemeier.**

First Part of the General Maps for the Illustration of Physical Geography. Edited by Axel Staggemeier, Copenhagen, 1893. Pl. I. Prospect of Geographical Positions between the Arctic Pole and the parallel on 30° N.—Pl. II. Prospect of Geographical Positions on the Atlantic Face of the Middle-Zones.—Pl. III. Prospect of Geographical Positions on the Pacific Face of the Middle-Zones.—Pl. IV. Prospect of Geographical Positions on the Indian Face of the Middle-Zones.—Pl. V. Prospect of Geographical Positions, between the Antarctic Pole and the Parallel on 30° S. E. Stanford, London. *Price 8s. Presented by E. Stanford.*

These are a nicely drawn set of maps, specially constructed for the purpose of furnishing geographers with the means of plotting on them routes, magnetic curves, physical phenomena, &c., for which purpose they are well suited.

The World.**Andree.**

Andrees allgemeiner Handatlas in 91 Haupt- und 86 Nebenkarten, nebst vollständigem alphabetischem Namenverzeichnis. Dritte, völlig neubearbeitete und vermehrte Auflage. Herausgegeben von der geographischen Anstalt von Velhagen & Klasing in Leipzig. Bielefeld und Leipzig; verlag von Velhagen & Klasing, 1893. *Price 28 marks.*

This is a new edition of Andree's Handatlas, which has been corrected and brought up to date. It contains ninety-one principal, and eighty-six inset maps, and is furnished with an alphabetical index containing all the names that appear on the maps.

The World.**Debes.**

E. Debes' neuer Handatlas über alle Teile der Erde in 59 haupt- und weit über 100 Nebenkarten, mit alphabetischen Namenverzeichnissen. Ausgeführt in der geographischen Anstalt der Verlagshandlung, Leipzig. H. Wagner & E. Debes. Parts 1 and 2. *1·80 marks each part. Presented by the Publishers.*

These form the first two parts of a general atlas which will be published in seventeen parts, and, when completed, will consist of fifty-nine principal maps and one hundred insets. The present issues contain maps of Alsace-Lorraine and North-east France, South-east Russia, North-east Germany, Italy, and Greece. The maps are very nicely drawn, and each is accompanied by an index.

The World.**German Admiralty.**

Weltkarte zur übersicht der Meeresstiefen, mit Angabe der unterseeischen Telegraphen-Kabel und Überland-Telegraphen, sowie der Kohlen-Stationen und Docks. Herausgegeben von dem Reichs-Marine-Amt. Nautische Abtheilung. Ausgabe mit Meeresstiefen und Höhenschichten, 1893. Scale $6\frac{1}{2}^\circ$ (Equal) to an inch. Mercator's Projection. Berlin, Geographische Verlagshandlung, D. Reimer, Inhaber, Hoesfer & Vohsen. 3 sheets. *Price 14 Marks. Presented by the Publishers.*

The colouring of this map is well-chosen to illustrate the purposes for which it has been published. Heights of the land are indicated by different shades of brown, from sea-level to over 2000 metres; depressions below sea-level are coloured green. The depths of the ocean are shown in five different shades of blue, extending to 6000 metres. In addition to this, a great deal of useful information with regard to dock, coaling-stations, and telegraphic communication, is indicated by symbols; some of the railways, however, are not up to date, none being laid down in Natal, or in Portuguese East Africa, and Angola. The map is very nicely drawn, and the registering is perfect.

The World.**Muller.**

Remarkable Maps of the 15th, 16th, and 17th centuries, reproduced in their original size. Part I. The Bodel Nyenhuis Collection at Leyden. Amsterdam, Frederik Muller and Co., 1894. *Price £1 10s. Presented by the Publishers.*

This is the first part of an important series of facsimiles of maps of the 15th, 16th, and 17th centuries, taken from the Bodel Nyenhuis Collection at Leyden. It is the intention of the publishers to issue six of such parts, which will contain maps of the highest interest for the history of geography of North America, Brazil, the Pacific

Ocean, and Australasia. They have been produced, in a very satisfactory manner, by photo-lithography, on Dutch hand-made paper, and it is announced that only one hundred copies will be printed. The present issue contains the following maps:—1-4. Gastaldi's (?) Map of the World. Venice, Tramizini, 1554.—5-6. Globe, published at Lyons by Guilhelmus Nicolai Belga, 1603.—7-8. Franciscus Hoeius' Map of the World, *circa* 1600; re-published, with later discoveries, by Hugo Allardt, Amsterdam, *circa* 1640.—9. Abraham Goos' Globe, published by Joh. Janssonius at Amsterdam, 1621.—10. Ferrando Berteli's Map of Parts of America, Western Europe, and Africa, *circa* 1560.—11. Paulo Forlani's Map of Africa, Venice, 1562.—12. America and the Pacific Ocean. Venice, published by Rascicotti, engraved by Mazza, *circa* 1583.—13. Nova Francia, Italian Map, *circa* 1560.—14. Dutch East Indies, Venice, *circa* 1560.

The World.

Pennesi.

Atlante Scolastico per la Geografia Fisica e Politica di Giuseppe Pennesi.
Istituto Cartografico Italiano. Roma, 1894. Fascicolo I. Price 3/80 li.
Presented by the Istituto Cartografico Italiano.

Considering the very moderate price of this atlas, it is worthy of more than a mere announcement of its publication. It contains a set of general physical maps in addition to which there are orographical and political maps of the separate continents and Italy. An excellent feature in this atlas is that physical and political maps of each continent which, with the exception of Europe, are drawn on an uniform scale, face one another, which arrangement will be of great assistance to pupils, for whose use the atlas is published.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty.
July, August, September and October, 1893. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
1821 m	= 1.55	France, north coast:—Asnelles to Villero, including Caen Roadstead. 2s. 6d.
2210 m	= various	Black Sea:—Karaji Bay. Eupatoria Road. Yalta Road. Utrish Point Anchorage. Jubg Anchorage. Poti Harbour. Tuabs Anchorage. Yalta and Urzuf Roads. 1s. 6d.
2200 m	= 5.78	Newfoundland, west coast:—Port Saunders, Keppel and Hawke Harbours. 1s. 6d.
407 m	= 4.0	Canada, Lake Huron:—Penetanguishene Harbour. 1s. 6d.
1155 m	= various	South America, north coast:—Entrance to the Maroni River. Surinam River, from the Light-vessel to Domburg. Entrance to the Coppename and Saramacca Rivers. Entrance to the Corentyne River. 1s. 6d.
1294 m	= various	Plans on the coast of Peru:—Talara Bay. Lambeyeque Road. Pecosmavo Road. Malabrigo Bay. Huanchaco Road. Bay of Santa. Casma Bay. Port Samanco or Guambacho. Huarmey Bay. 1s. 6d.
1948 m	= 2.01	Red Sea, western shore:—Mersa Makdah and Approach to Trinkitat. 1s. 6d.
59 m	= 4.5	India, west coast:—Deogarh Harbour. 1s. 6d.
2056 m	= 0.23	Eastern Archipelago:—Sunda Strait and Approaches. Plans:—Kalanbayang Harbour. Kiloang Harbour. New Anjer Road. Fourth Point to Old Anjer. 2s. 6d.
1936	— — —	Island in the North Pacific Ocean:—Plan added, Melpomene Cove.
1826 m	= 0.05	England, west coast:—Formby Point to Kirkcudbright. 3s.
2607 m	= 0.49	Mediterranean, south coast of France:—Marseille to Agay Road. 2s. 6d.

No.	Inches.	
2608 m = 0·98		Mediterranean, south coast of France:—Approaches to Toulon. 2s. 6d.
1841 m = 0·28		Mediterranean, west coast of Italy:—Civita Vecchia to Naples. 2s. 6d.
1483 m = 2·41		Adriatic Sea:—Parts Chioggia, Malamocco, and Lido, and the channels leading to Venice. 2s. 6d.
1947 m = 0·52		North America, west coast:—Admiralty inlet and Puget Sound. 2s. 6d.
1862 m = 0·24		Africa, west coast:—Lekki to River Dodo. 2s. 6d.
1890 m = 24·0		Australia, east coast:—Woolloomooloo and Farm Cove anchorages. 1s. 6d.
1350 m = 12·0		Australia, east coast:—Cook Harbour. 1s.
1486 m = various		South Pacific Ocean, New Hebrides:—Anchorage in New Hebrides Islands. 1s. 6d.
585 — — —		Anchorage in the Strait of Georgia:—Plan added, Union wharf and anchorage.

(J. D. Potter, Agent.)

CHARTS CANCELLED.

No.	Cancelled by—	No.
2211 Yalta and Urzuf Roads	New sheet. Plans in the Black Sea	2210
2236 Plan of Polti Harbour on this chart		
407 Penetanguishene Harbour	New Plan. Penetanguishene Harbour	407
Goderich Harbour		
1155 { Mouth of the River Corentyn	New Plans. Entrance to the Maroni River, &c.	1155
1155 { Mouth of the River Maroni		
2908 Surinam River		
1813 Plan of Talara Bay on sheet	New sheet. Plans on the coast of Peru	1294
1294 Plans on this sheet		
1311 Plans on this sheet		
1368 Plans on this sheet		
59 Deogarh Harbour	New Plan. Deogarh Harbour	59
2056 Sunda Strait and its approaches	New Chart. Sunda Strait and approaches	2056
1508 Plan of Shepherd Isles on this sheet		
1826 Formby Point to Firth of Solway	New Chart. Formby Point to Kirkcudbright	1826
2607 Marseille to Hyeres		
2608 Hyeres to Rade d'Agay road	New Chart. Ports Chioggia, Malamocco, and Lido, and the channels leading to Venice	1483
1483 Ports Malamocco and S. Nicolò del Lido, with the channels leading to Venice		
1947 Admiralty Inlet and Puget Sound	New Chart. Admiralty Inlet and Puget Sound	1947
1862 Lekki to River Forcados		
1350 Cook Harbour	New Plan. Cook Harbour	1350
1508 Plan of Tangoa anchorage on this sheet		
376 St. Antonio Island.	New Plan. Tangoa Anchorage on	1486
380 Bonavista Island.		
383 St. Jago Island.		

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS:

No. 30, England, south coast:—Plymouth Sound and Hamoaze. 2682, Bristol Channel:—Nash Point to New Passage. 108, England, east

coast:—The Wash. 2329, Norway, south coast:—Sandö to Stervør. 2603, France, south coast. Palamos to Cape Béarn. 1184, Africa, north coast:—Bay and Lake of Tunis. 2830A, River St. Lawrence, Quebec, to point du Lac. 2830B, River St. Lawrence:—Point du Lac to Lachine Rapids. 1901, North America, west coast:—Ogden Channel, with anchorages between Cape Caution and Port Simpson. North America, west coast:—Port Simpson. 671, Africa, east:—Port Durnford. 40, India, west coast:—Karachi Harbour. 1353, Malacca Strait:—Diamond Point to North Sands. 1342, Cochin China:—Fang-rang Bay to Tong-king Gulf. 1994, China, east coast:—San-Mun Bay and Sheipu Harbour. 205, Japan Nanao Harbours. 2657, Japan, Gulf of Tokyo or Yedo. 732, Pacific, Gilbert Islands:—Makin and Taritari. Tarawa. Maraki. Apaiang. Maiana. (*J. D. Potter, Agent.*)

No. 1951, England, west coast:—Liverpool Bay. 2476, Scotland, west coast:—Firth of Lorn. 1352, France, north coast:—Dunkerque. 2328, Norway:—Christiansand to Sandö. 2300, Baltic. Gulf of Bothnia:—Stiernö Point to Fiaderäg. 169, Sicily:—Palermo Bay. 2733, Iceland:—Portland to Sneffells Jökul. 239a, River St. Lawrence:—Montreal to Ogden Island. 1365, Africa, west coast:—Baffu Bay to Grand Berebi. 1361, Africa, west coast:—Fernando Po to Cape Lopez. 1003, Africa, east coast:—Pungwe River. 928, Sulu Sea:—Sulu Archipelago. 2637, Eastern Archipelago:—Strait of Makassar, south part. 1466, China, south coast:—Hongkong. Fotumun Pass. 2415, Japan:—Nagasaki Harbour. 2875, Japan:—Seto-uchi or Inland Sea. (*J. D. Potter, Agent.*)

North Atlantic Ocean.

U.S. Hydrographic Office.

Pilot Chart of the North Atlantic Ocean, November, 1893, with Supplement of six synoptic weather charts, illustrating weather conditions of two cyclones of August 1893. Published by the Hydrographic Office, Bureau of Navigation, Navy Department, Washington, D.C., 1893. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Heligoland.

Isaacson.

Twelve photographs of Heligoland in 1890. *Presented by F. J. Wootton Isaacson.*

These consist of photographs taken by Mr. F. J. Wootton Isaacson just before and during the cession of Heligoland to Germany.

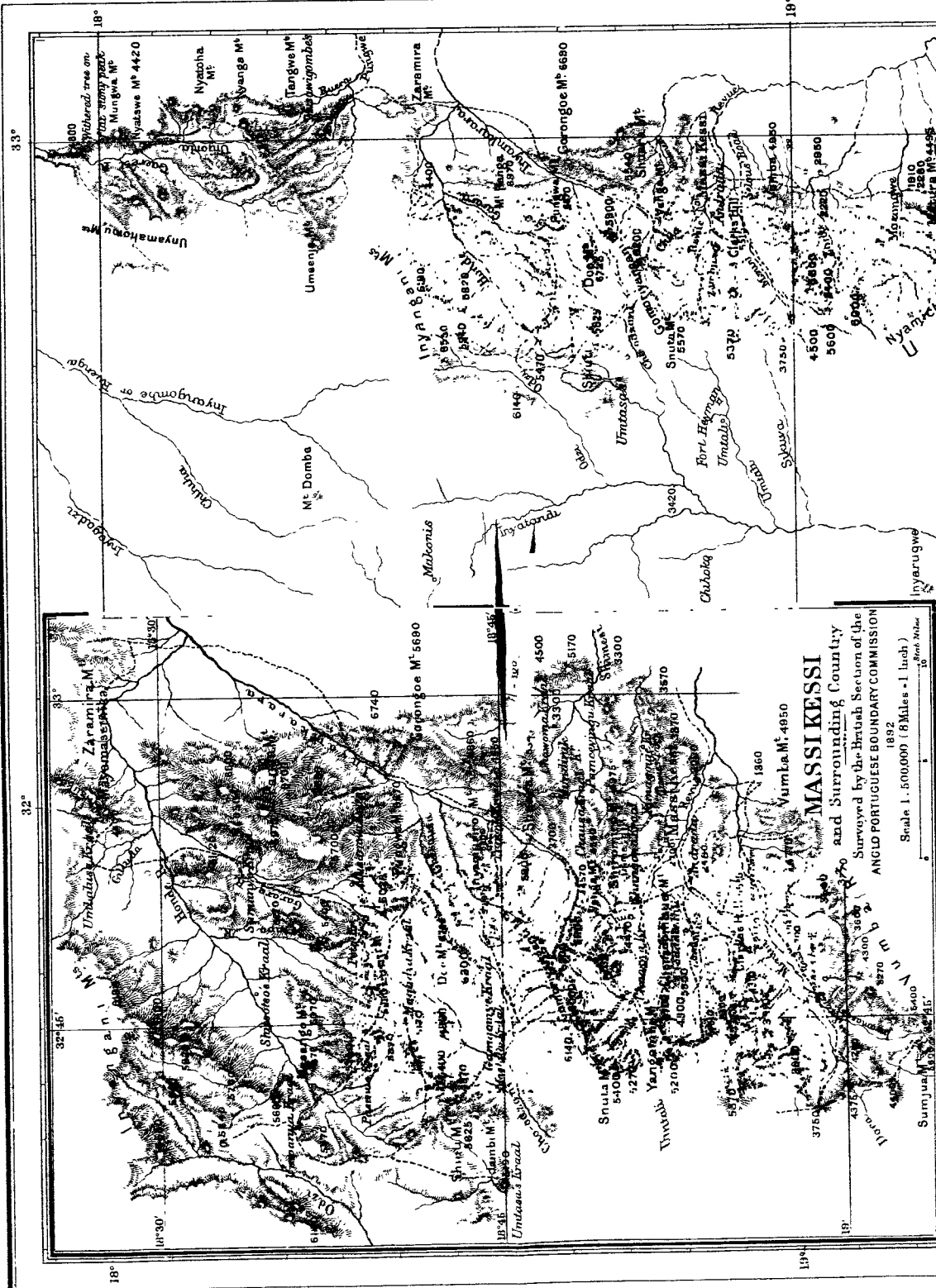
Kashmir.

Deasy.

Twenty photographs taken in Kashmir. *Presented by Lieut. H. H. P. Deasy.*

This series consists of twenty photographs taken in Kashmir by Lieut. H. H. P. Deasy, 16th Lancers. They are well-chosen views of the scenery and characteristic groups of natives.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



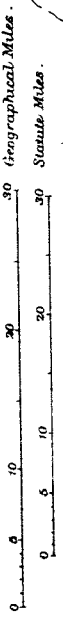
MAP OF THE
ANGLO PORTUGUESE BOUNDARY
IN
EAST AFRICA.

From the North Eastern Corner of the South African Republic
to Latitude 18° S.

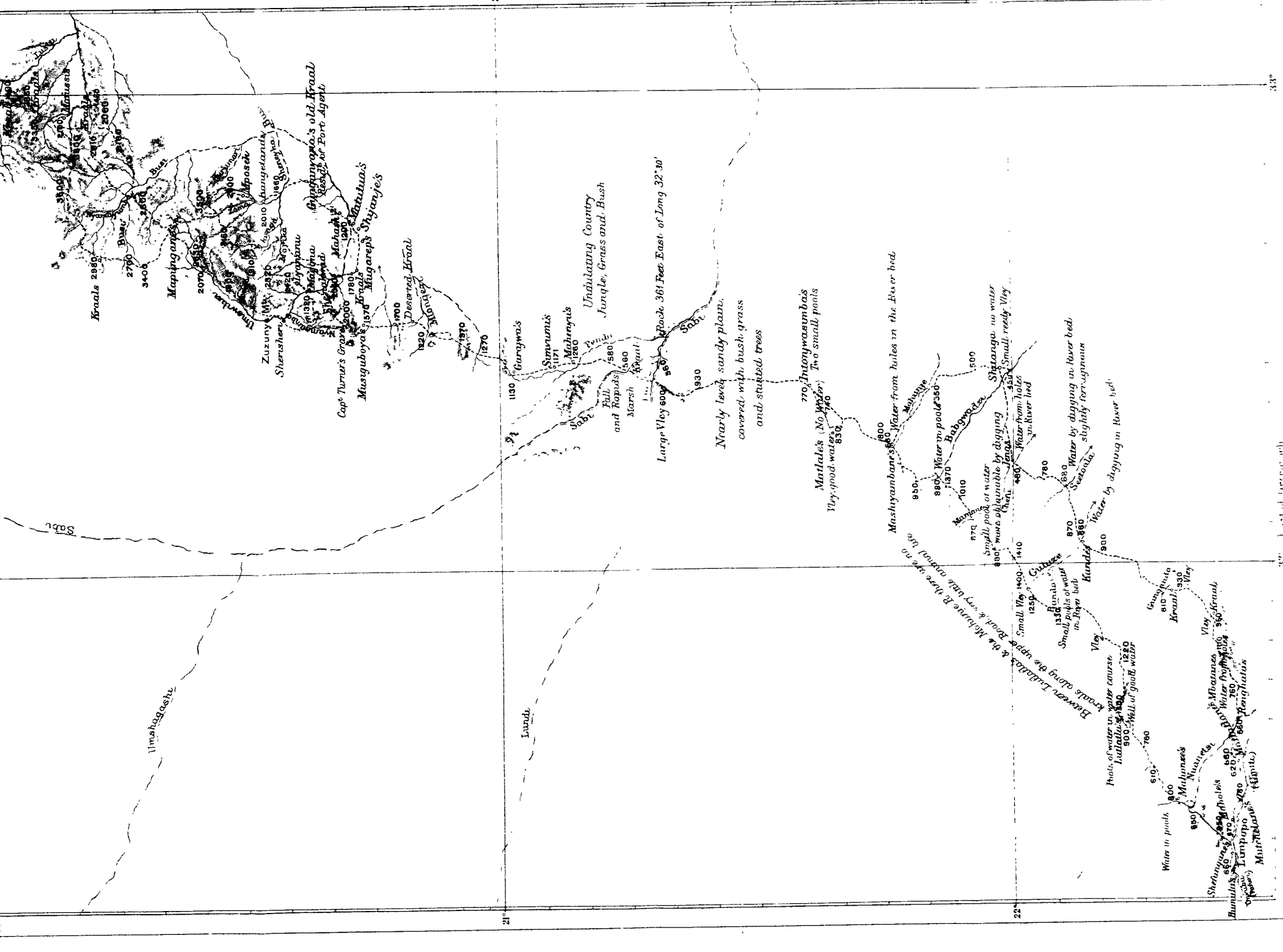
Constructed by the British Section of the
ANGLO-PORTUGUESE BOUNDARY COMMISSION,
1892.

By Major J.J. Levenson, R.E. British Commissioner.
Capt S.C.N. Grant, R.E. & Lieut. C.S. Wilson, R.E.
assisted by
Sergeant D. Clarke, R.E. & 2nd Corporal T. Johnson, R.E.

Scale, 1: 1,000,000. (16 Miles - 1 Inch.)



Bush or Trees





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